HITACHI

MODEL V-151B, 152B
OSCILLOSCOPE

SERVICE MANUAL

Hitachi Denshi, Ltd.

CONTENTS

1. Specification 1
2. Composition 3
3. Preventive Maintenance 4
4. Calibration 6
5. Disassembly illustration 20
6. Circuit board illustration(with Adjustment Location) 21
7. Diagram 26
8. Parts lists 38
   - Electrical parts lists..... 38
   - Mechanical parts lists..... 70

1. SPECIFICATION

CRT Display	
Type	130BUB31
Acceleration Voltage	2KV
Effective display area	8 × 10 div (1 div=9.5mm)
Vertical amplifier	
(Identical for both channels)	5mV/DIV ~ 5V/DIV
Sensitivity:	Calibrated in 10 steps (1-2-5 Sequence up to about 2.5 times with Variable control)
	1mV ~ 1V/DIV (using x5 GAIN)
Bandwidth	DC to 15MHz $^{+1}_{-3}$ dB
	DC ~ 5MHz $^{+1}_{-3}$ dB (using x5 GAIN)
Rise time	24n Sec
Input impedance	IMΩ shunted by 30pF ±5pF (direct)
Input coupling	AC, GND, DC
Max.input voltage	$600V_{p-p}$, 300V(DC+AC peak)
Input connector	BNC
Time base	
Sweep speed	0.2μs ~ 0.2s/DIV
	19 step, 1-2-5 sequence
Magnification	x10 (max speed 100 ns/div)
X-Y display	
(V-151B: X=Ext. TRG or X IN, Y=INPUT)	
Sensitivity	Y axis: 5mV/DIV ~ 5V/DIV
	X axis: Approx. 0.2V/DIV
Bandwidth	X axis: DC ~ 500 KHz
X-Y phase	Less than 3° at 10 KHz

(V152B:X=CH1, Y=CH2)

Sensitivity	Y axis: 5mV/DIV ~ 5V/DIV
	X axis: 5mV/DIV ~ 5V/DIV
Bandwidth	X axis: DC ~ 500 KHz
X-Y phase	Less than 3° at 10KHz

Synchronization

Trigger sensitivity

Frequency	INT. trig	EXT. trig
20Hz ~ 2MHz	0.5DIV	200 mV
2MHz ~ 15MHz	1.5DIV	800 mV

Vertical MODE (V-152B)

MODE; CH1, CH2 (X-Y), DUAL, ADD, DIFF

DUAL: DUAL trace display

ADD: CH1 and CH2 are added

DIFF: CH2 and CH2 (inverted signal) are added

Trigger MODE

AUTOmatic : Sweep free-runs

NORMAL : Sweep runs when triggered.

TV(+),TV(-): Extracts the synchronizing signal from composite video signal and provides stable synchronization. Slope switch is selected according to polarity of video signals.

SOURCE; INTernal (V-152B; CH1 or CH2) or EXTernal or LINE.

Calibration

Waveform	Square wave 1KHz ±10%
Voltage	0.5 Vp-p ±5%
Power supply	AC 100/120/220/240V
size and weight	190(H) × 275(W) × 400(D)mm 8.5Kg
	[7.5(H) × 10.8(W) × 15.7(D)in 18.7 lbs]

2. COMPOSITION

(1) V-151B, V-152B oscilloscope···· 1

(2) AT-10AB1.5 Probe ····· 1(V-151B), 2(V-152B)

(3) Operation manual ····· 1

(4) Power supply cord ····· 1

3. PREVENTIVE MAINTENANCE

Preventive maintenance, when performed on a regular basis, can prevent instrument breakdown and may improve the reliability of the oscilloscope. The severity of environment to which this instrument is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration of the instrument.

Disassembly

Remove the 6 screws in the top cover of the instrument. Gently separate the top cover from the instrument and lay aside. Most of the internal parts of the instrument are now accessible.

If access to the front of the Input circuit board is necessary, remove the knobs from all of the external control shafts. Remove the two screws securing the side panel to the Input circuit board and remove the instrument side panel. (See 5. DISASSEMBLY ILLUSTRATION.)

Cleaning

The instrument should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause component breakdown.

The covers provide protection against dust in the interior of the instrument. Loose dust accumulated on these covers can be removed with a soft cloth or small brush.
Dirt that remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

Cleaning the interior should only be occasionally necessary. The best way to clean the interior is to blow off the dust with a dry, low-velocity stream of air. A soft-bristle brush or a cotton-tipped applicator is useful for cleaning in narrow spaces or for cleaning more delicate components.

Visual Inspection

The instrument should be inspected occasionally for such defects as broken connections, improperly seated transistors, damaged circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is apparant; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, correcting the cause of the overheating is important to prevent recurrance of the damage.

4. CALIBRATION.

Hitachi Denshi, Ltd. provides complete instrument repair and recalibration at our oversea's office, and authorized dealer. Contact your local Hitachi Denshi, Ltd. office or representative.

4.1 TEST EQUIPMENT REQUIRED

The following test equipment and accessories, or equivalent, are required for the complete calibration of the V-151B, 152B. The given specifications for the test equipment are the minimum necessary for accurate calibration. Therefore, the specifications of any test equipment used must meet or exceed the listed specifications. All the test equipment is assumed to be correctly calibrated and operating within the listed specification. operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment if more information is needed.

Table 4-1

TEST EQUIPMENT REQUIRED

Description	Minimum Specification	Usage	Examples of Applicable Test Equipment
1. Constant Amplitude Signal Generator	50kHz reference frequency; maximum frequency 40MHz; variable amplitude.	Check horizontal, vertical and trigger bandwidth.	
2, Standard Amplitude Calibrator	Amplitude accuracy: 0.25%, variable amplitude; 5mV to 40 V; frequency: 1 kHz square wave.	Check horizontal and vertical gain.	
3. Square-wave Ge Generator	Variable frequency: 10 Hz to 1 MHz; output amplitude; 10 mV to 100 V	Check probe and vertical compensation.	
4. Digital Multimeter	0.1% accuracy.	Check power supply	
5. Time Mark Generator	o.1% accuracy.	Check horizontal timing.	
6. Cable	Impedance, 50 ohms; type, RG-58/U; length, 42 inches, connectors, BNC.	External trigger operation check. Horizontal gain check and adjustment.	Hitachi Part No.4202
7. Termination	Impedance, 50 ohms; connectors, BNC	Vertical Amplifier compensation checks and adjustment.	
8. Attenuator	Ratio, 10X; connectors, BNC; impedance, 50 ohms.	Vertical Amplifier bandwidth check.	
9. T-Connector	Connectors, BNC.	External trigger operation checks.	Hitachi Part No.1301

4.2 PRELIMINARY PROCEDURE

This instrument should be calibrated at an ambient temperature of +20°C (±5°C) for best overall accuracy.

1. Connect the instrument to AC line voltage, 50/60 Hz line source.
2. Set the instrument controls as given in the Preliminary Control Settings. Allow at least fifteen minutes of warmup before proceeding.
3. See the Adjustment Locations in the pullout pages.

4.3 PRELIMINARY CONTROL SETTINGS

Preset the instrument controls to the settings given below, when starting the calibration procedures.

	V-151B	V-152B
FOCUS	Midposition	Midposition
TRACE ROTATION	Midposition	Midposition
V.POSITION	Midposition, push in	Midposition, push in
V.VARIABLE	CAL, fully clockwise	CAL, fully clockwise
AC-GND-DC	GND	GND
VOLTS/DIV		
V.MODE		CH1
TIME/DIV	1mS	1mS
SWP or [X] VAR SWP VAR	CAL, fully clockwise	CAL, fully clockwise
H.POSITION	Midposition, push in	Midposition, push in
Trig. LEVEL	Midposition, push in	Midposition, push in
Trig. MODE	AUTO	AUTO
Trig. SOURCE	INT	CH1

Table 4-2
PRELIMINARY CONTROL SETTING.

4.4 INITIAL STARTING PROCEDURE

1. Rotate POWER/INTENSITY control to the midposition.
2. Wait a few seconds for the cathode ray tube (CRT) to warm up. A trace should appear on the fact of the CRT.
3. If no trace appears, increase (clockwise) the POWER/INTENSITY control setting until the trace is easily observed.
4. Adjust FOCUS control for the thinnest, sharpest trace.
5. Readjust POSITION controls if necessary, to center the trace.

POWER SUPPLY SYSTEM

NOTE

Before you begin, see ADJUSTMENT LOCATIONS in the pullout pages.

Control Settings

Preset the controls as given in the Preliminary Control Setting.

1. Check Low-voltage Supply, if necessary
   a. Connect the digital voltmeter (DVM) from the +5 volt line.
      :+5V ±5% (IC1131)
   b. Connect the DVM from the +12V line
      :+12V ±5% (IC1111)
   c. Connect the DVM from the -12V line
      :-12V ±5% (IC1121)
   d. Connect the DVM from the +150V
      :+150V ±5%
2. Check/Adjust High Voltage Supply
   a. Connect the DVM to the H.V test point
   b. Check for a reading of 1900V ±40V

c. Adjust the High Voltage adjustment RV1001 for nearly 1900V

3. Check/Adjust Grid Bias

a. Rotate the POWER/INTENSITY to the $^{1}/_{3}$ of fully way as shown.

b. Observe the trace of CRT.

c. Adjust Grid Bias Adjustment RV1021 for the trace makes an appear.

DISPLAY

Control Setting

Preset the controls as given in the Preliminary Control Setting.

4. Check/Adjust ASTIG matism and FOCUS.

a. Set the TIME/DIV switch to the X-Y position, and Vertical MODE (in case of V-152B) switch to the CH2/X-Y position.

b. Set the POWER/INTENSITY control for a small spot, near center of screen using position controls.

c. Check that the spot is round.

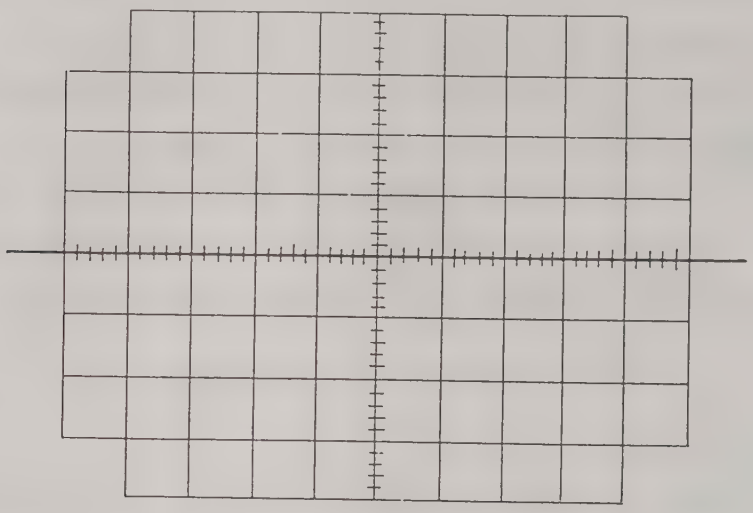
d. Adjust the FOCUS adjustment and the ASTIG adjustment RV1035 for a round spot.

5. Check/Adjust Trace Rotation

a. Set the TIME/DIV switch to 1mS.

b. Check that the trace is parallel to the center horizontal line.

d. Adjust TRACE ROTATION for a trace that is parallel with the horizontal graticule lines.



6. Check/Adjust GEOMetry

   a. Set the TIME/DIV switch to the 1mS, and AC-GND-DC to DC.

   b. Connect the Constant Amplitude Signal Generator to the input.

   c. Set the VOLTS/DIV switch setting for a full-screen (8 division) deflection.

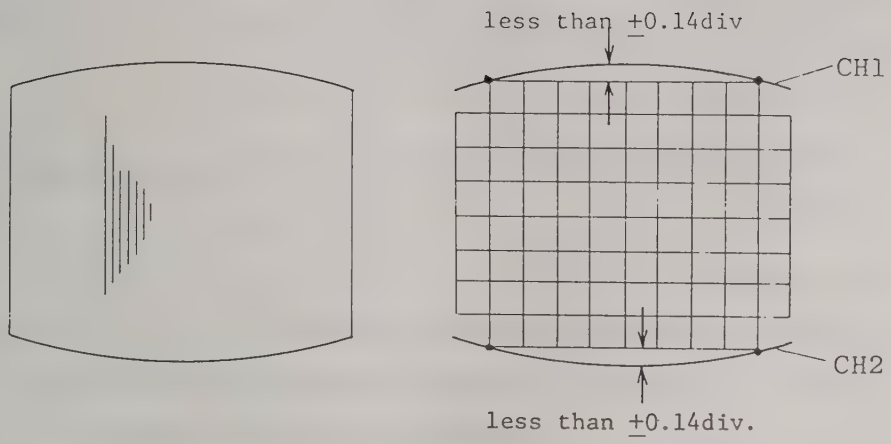
   d. Check that horizontal bowing is less than $\pm$0.14 division.

   e. Adjust the GEOM adjustment RV1034 for a display that is parallel with top and bottom horizontal lines.

Note;

For the V-152B,also it is possible the adjustment of GEOM as follow.

   a. Set the verticul MODE to the DUAL.



b. Rotate the POSITION (CH1) control to the top the trace

c. Rotate the POSITION (CH2) control to the bottom the trace

d. Check and Adjust as before methode.

VERTICAL SYSTEM

Control Setting

Preset the controls as given in the Preliminary Control Settings.

7. Check/Adjust DC Balance (Step attenuator balance).

   a. Set the VOLTS/DIV switch to the 5mV position.

   b. Position the trace to the horizontal center line.

   c. Change the VOLTS/DIV switch to the 10mV position.

   d. Check that the trace is within 0.2 division of the center horizontal line.

   e. Adjust the DC BAL adjustment, RV11(CH1) or RV111(CH2), for a trace at the horizontal center line.

   f. Repeat part (a) through (e) until less than 0.2 division shift is noted when changing the VOLTS/DIV setting.

8. Check/Adjust Vertical Position Center.

   a. Confirm the vertical POSITION control at the midposition.

   b. Check the trace is within 1 division.

   c. Adjust the Position Center adjustment RV44(CH1), RV144(CH2) for a trace at the horizontal center line.

9. Check/Adjust ×5 AC GAIN

   a. Set the TIME/DIV switch to the 1mS position.

   b. Set the VOLTS/DIV switch to the 5mV position.

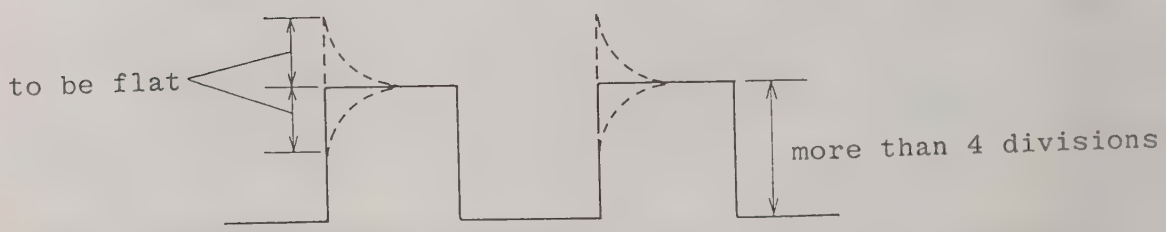
   c. Pull the vertical POSITION/ × 5 GAIN out.

   d. Connect the Square-wave Generator (using 1KHz out put range).

   e. Adjust the output amplitude of that generator for more than 4 division deflection of screen.

   f. Check the high-voltage level of pulse is flat.

   g. Adjust the ×5 AC GAIN RV16(CH1), RV116(CH2) adjustment for a flat level.



10. Check/Adjust ×1 AC GAIN.

   a. Push the vertical POSITION switch in.

b. Refere item 9 part (a) through (f) (except (c)).

c. Adjust the ×1AC GAIN RV18(CH1), RV118(CH2) adjustment for a flat level.

11. Check/Adjust Vertical Gain.

a. Set the VOLTS/DIV switch to the 5mV position and AC-GND-DC switch to DC.

b. Connect the standard amplitude calibrator to the input.

c. Set the standard amplitude calibrator for a $20mV_{p-p}$ (4 divisions of display) signal.

d. Check for a display of four divisions.

e. Adjust RV43(CH1), RV143(CH2) for a display of 4 divisions within 5%.

f. Check all the VOLTS/DIV switch settings.

12. Check/Adjust CAL terminal ($0.5V_{p-p}$).

a. Set the VOLTS/DIV switch to the 0.1V position.

b. Connect the CAL to the input.

c. Check for a display of five divisions.

d. Adjust RV1203 for a display of 5 divisions within 5%.

13. Check/Adjust Attenuation Compensation.

a. Set the VOLTS/DIV switch to the 0.1V position and AC-GND-DC switch to DC.

b. Connect the square-wave generator to the input for a 0.5V signal.

c. Check for a square wave that is flat (flat top).

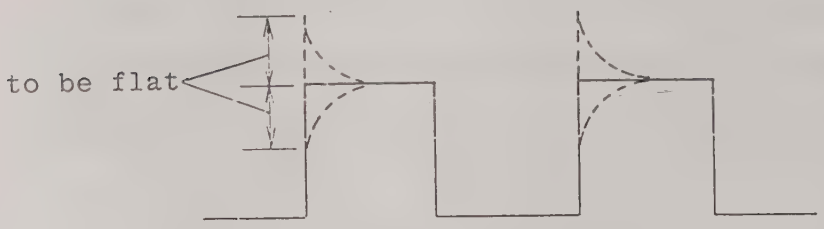
d. Adjust CV2(CH1), CV102(CH2) for a square wave that is flat (flat top).

e. Set the VOLTS/DIV switch to the 1V position.

f. Set the square-wave generator for a 5V signal.

g. Check for a square wave that is flat.

h. Adjust CV4(CH1), CV104(CH2) for a square wave that is flat.



14. Check/Adjust Probe Compensation.

a. Set the VOLTS/DIV switch to the 5mV position.

b. Connect the square-wave generator to the input. Use a plobe AT-10AB1.5.

c. Set the square-wave generator for a 0.2V signal.

d. Adjust the LEVEL control for a stable display, triggered on the positive excursion of the waveform.

e. Check that positive excursion of the displayed square wave is flat (flat top).

f. Adjust the trimmer capacitance of that plobe (in figure) the display is flat.

g. Set the VOLTS/DIV switch to the 0.1V position.

h. Set the square-wave generator for a 5V signal.

i. Check for a square wave that is flat.

j. Adjust CV1(CH1), CV101(CH2) for a square wave that is flat.

k. Set the square-wave generator for a 50V signal.

l. Check for a square wave that is flat.

m. Adjust CV3(CH1), CV103(CH2) for a square-wave that is flat.

15. Check/Adjust Vertical Step Response.

a. Set the VOLT/DIV switch to the 5mV position.

b. Set the TIME/DIV switch to the 5μS position, if necessary, to the 2μS position setting.

c. Pull the ×10 MAG switch out for a magnified display.

d. Connect the first-rise, positive output of the square-wave generator to input. Use a 50-ohm termination and cable.

e. Set the square-wave generator to 100kHz. Adjust the square wave generator output for a 4-divisions display.

f. Position the positive-going signal in the center of the graticule, with the top of the square wave visible.

g. Adjust CV330 and CV316 for a square wave that is flat.

(A slight readjustment of the CV316 might be necessary for a flat top with 0 ~ +8% over-shoot.)

16. Check/Adjust Vertical Bundwidth.

a. Set the VOLTS/DIV switch to 5mV, the TIME/DIV switch to 1mS and ×1 GAIN.

b. Connect the constant amplitude signal generator to the input. Use a 50-ohm termination.

c. Set the constant amplitude signal generator to 50kHz, and adjust the output amplitude of it for a deflection of four divisions.

d. Adjust the frequency of the constant amplitude signal generator until 2.8 divisions of deflection are present on the CRT screen.

e. Check that the frequency of the constant amplitude signal generator is greater than 15 MHz.

f. Adjust item 15 for deflection of at least 2.8 divisions at 15 MHz. Check display for a clean step response.

SWEEP TRIGGER

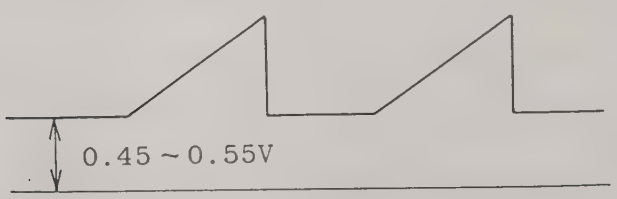
Control Settings

Preset the controls as given in the Preliminary Control Settings.

17. Check/Adjust the Sweep Start.

a. Check the voltage in TR502, collector for a +o.45V ~ +0.55V.

b. Adjust the RV504 for a +0.45V ~ 0.55V at that point.



HORIZONTAL SYSTEM

Control Settings

Preset the controls as given in the Preliminary Control settings.

18. Check/Adjust Horizontal Gain (Sweep Cal.)

    a. Set the TIME/DIV switch to the 1mS.

    b. Set the horizontal gain for a ×1 MAG.

    c. Set the input AC-GND-DC to DC.

    d. Connect the cable to the output of the time mark generator.

    e. Set the time mark generator for 1mS time marks.

    f. Check that the time marks align with the graticule lines over the center eight divisions.

    g. Adjust RV812 at that the time marks align with the center eight graticule lines.

    h. Check all other ranges of timing within 5%. Use appropriate settings on the time mark generator.

    i. Set ×10 MAG (Pull out).

    j. Adjust RV816 for one-cycle time marks align with the ten-divisions graticule lines.

19. X-Y Operation.

19-1 Check/Adjust X position Center

-V-151B-

a. Set the TIME/DIV switch to [X-Y] position; the horizontal POSITION control to midposition.

-V-152B-

a. Set the TIME/DIV switch to [X-Y] position, the vertical MODE switch to CH2/ [X-Y] position and the horizontal POSITION control to midposition.

c. Check a round spot for the center graticule within/ division against horizontal line.

d. Adjust RV806 the spot for the center.

19-2. Check/Adjust X Gain.

—V-151B-

a. Set the AC-AND-DC switch to GND.

b. Set the TIME/DIV switch to [X-Y] .

c. Connect the standard amplitude calibrator to the EXT TRIG or [X] in.

d. Set the standard amplitude calibrator for a $1V_{p-p}$.

e. Check for a display of five divisions.

f. Adjust RV273 for a display of 5 divisions.

—V-152B-

a. Set the TIME/DIV switch to [X-Y] .

b. Set the AC-GND-DC switch of CH1 to DC, the AC-GND-DC switch of CH2 to GND.

c. Set the VOLTS/DIV switch to the 5mV position, with 1 GAIN.

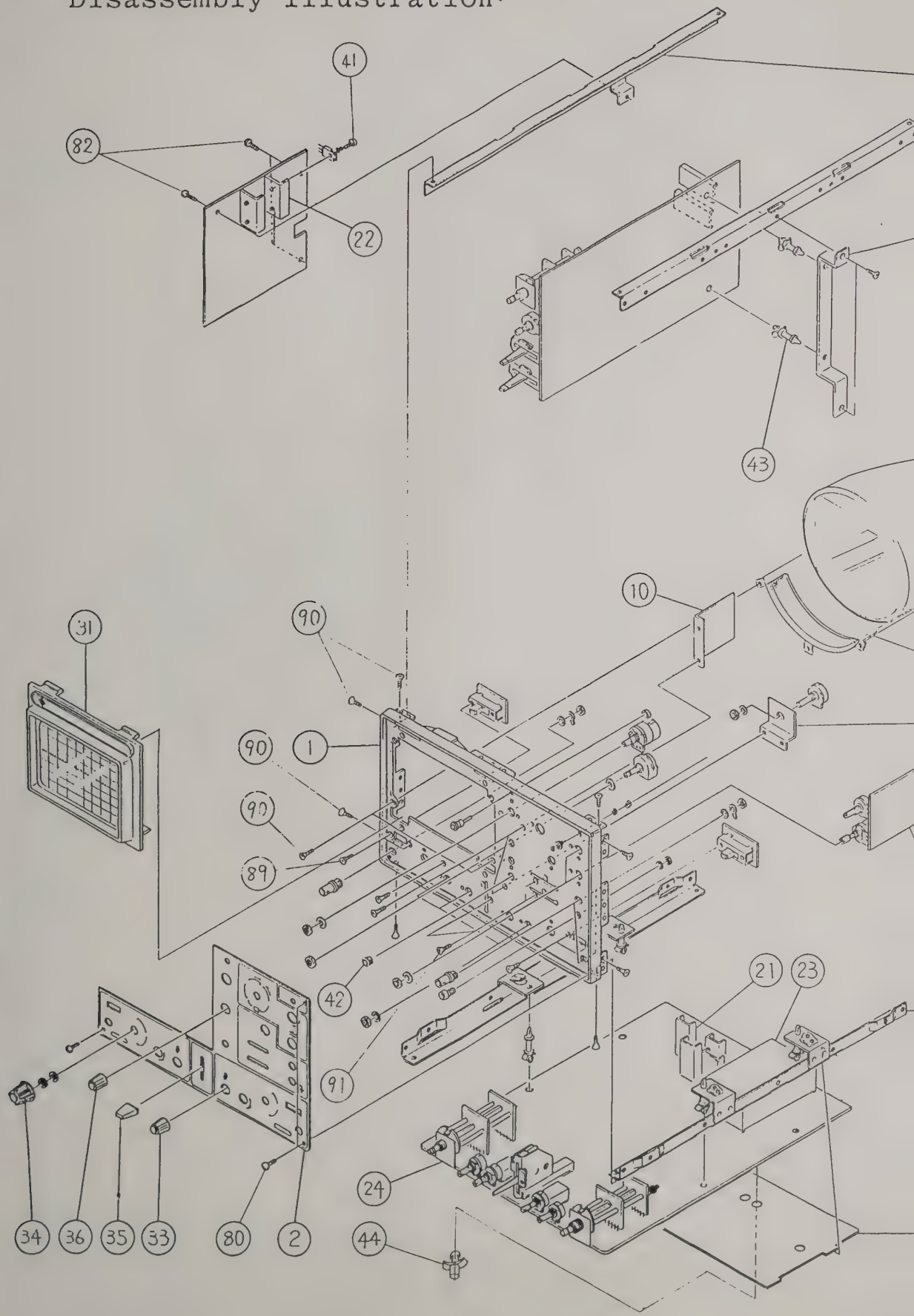
d. Connect the standard amplitude calibrator to the CH1 input.

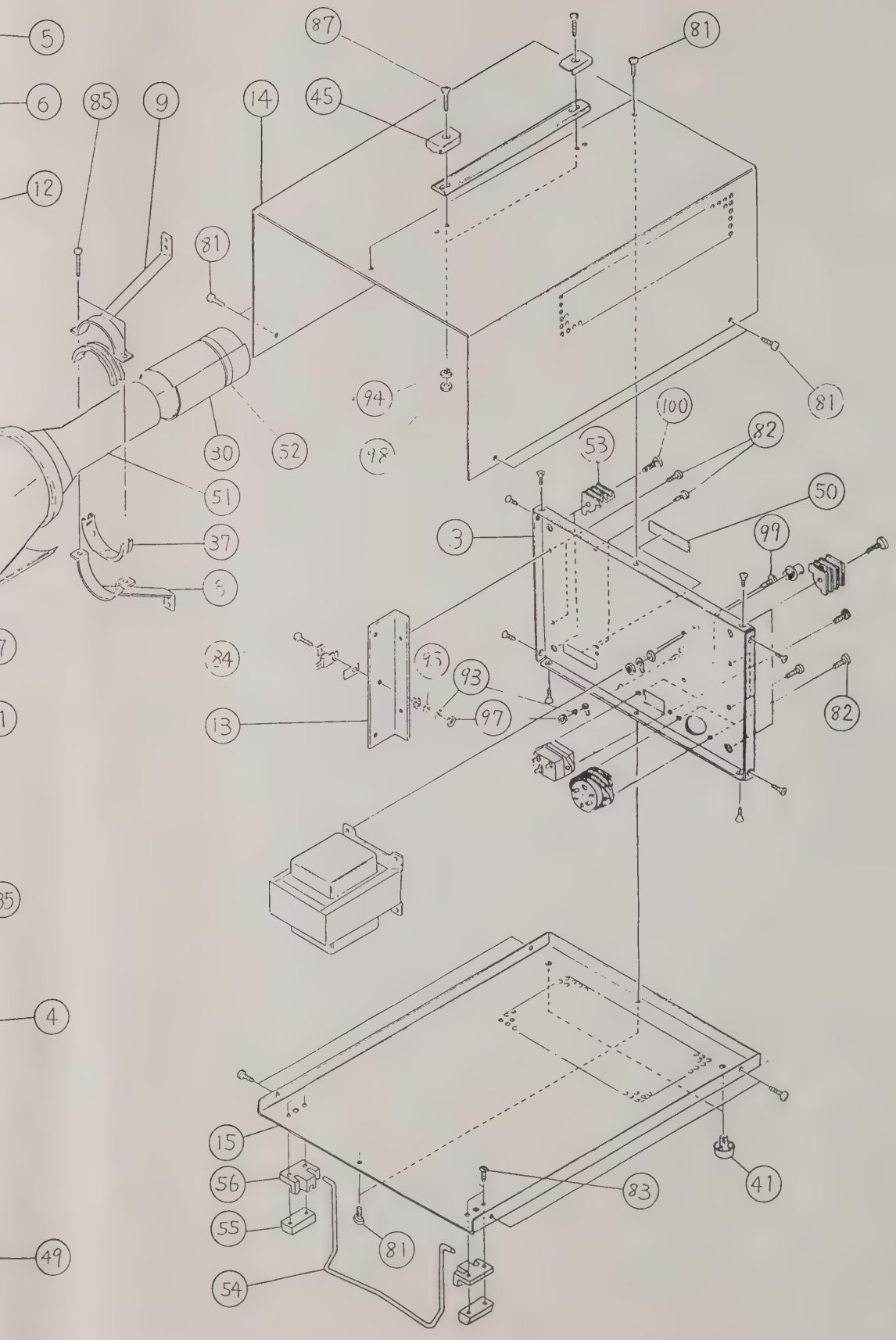
e. Set the standard amplitude calibrator for a 20 mV.

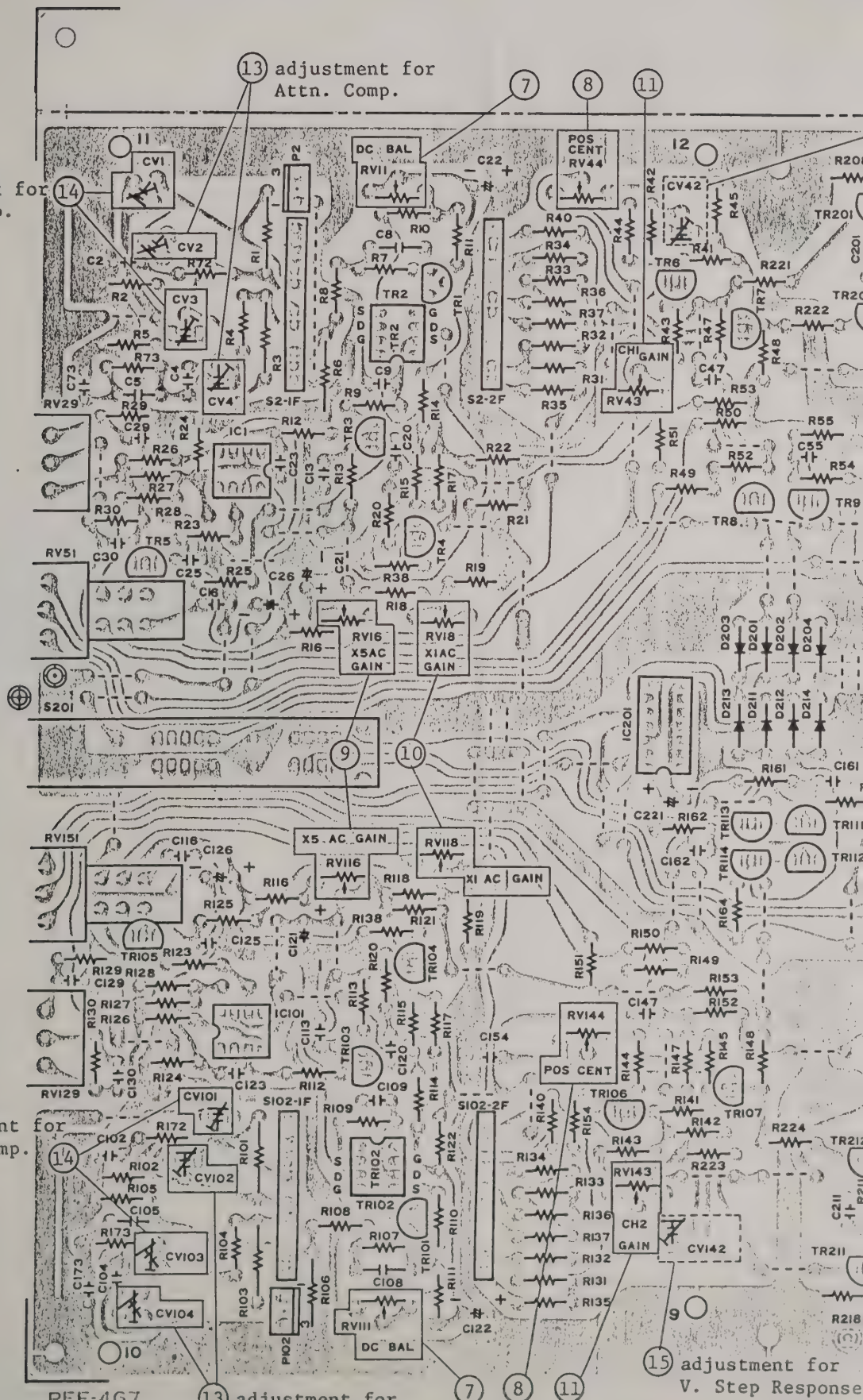
f. Check for a display of 4 divisions.

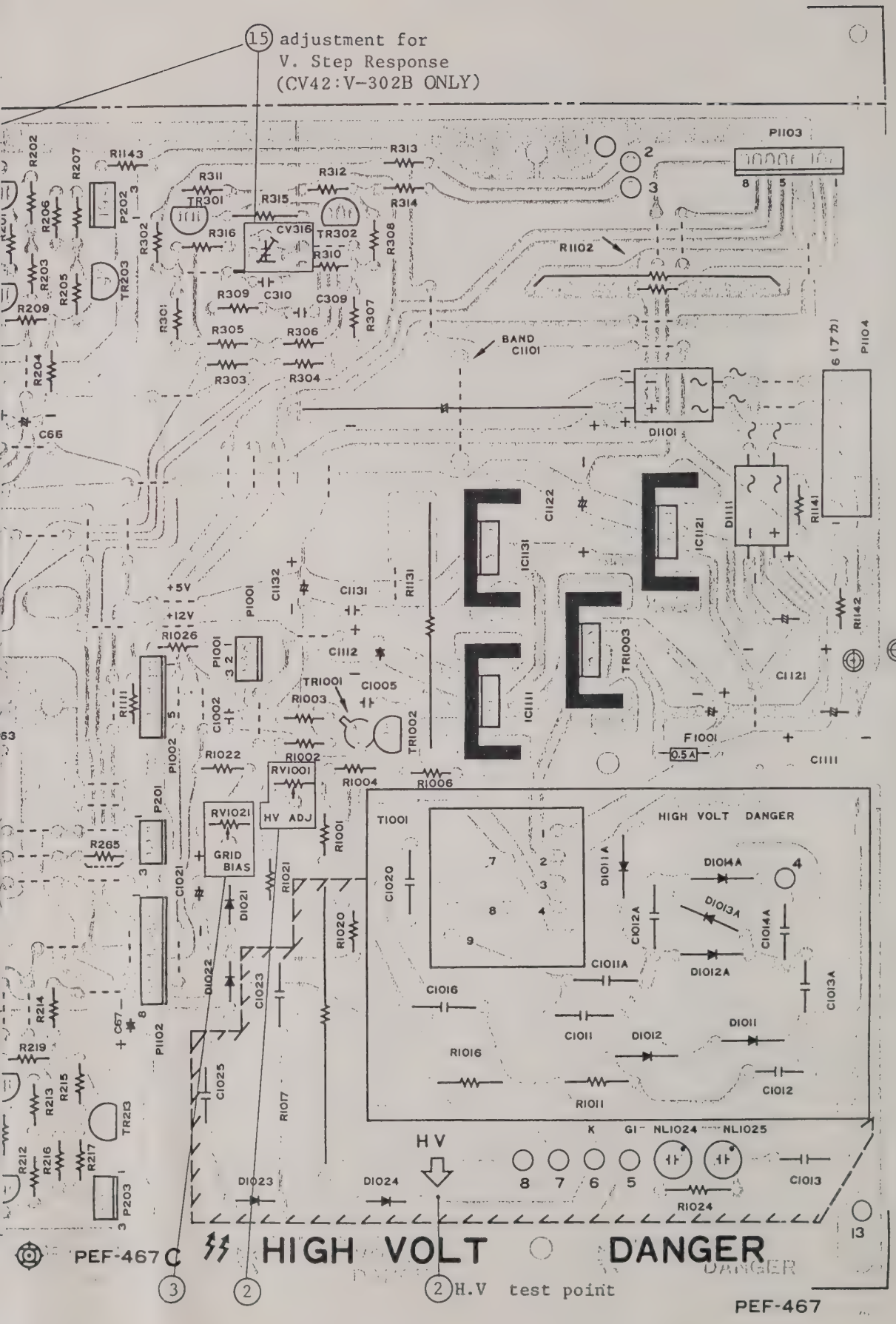
g. Adjust RV804 for a display of four divisions.

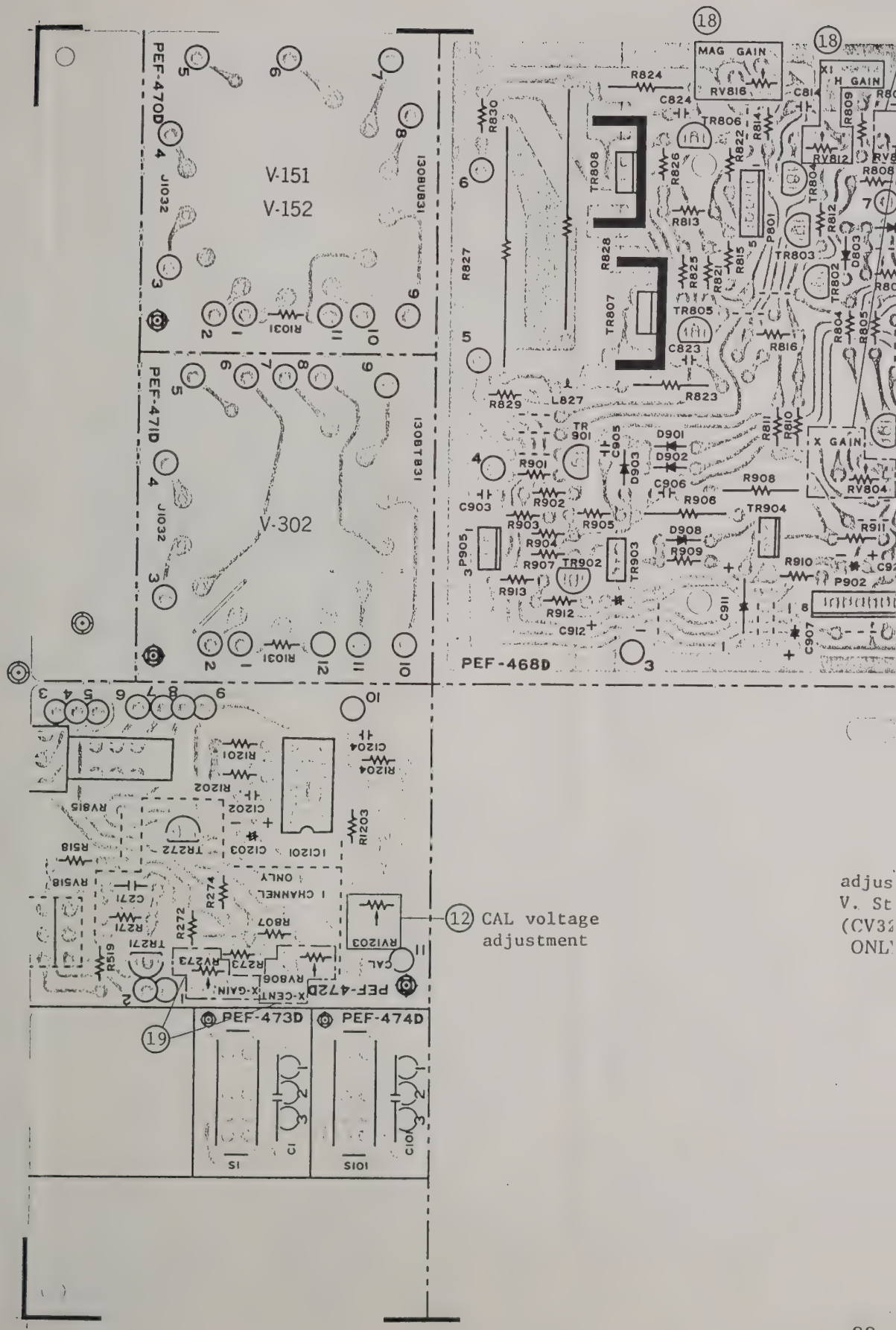
Disassembly illustration·



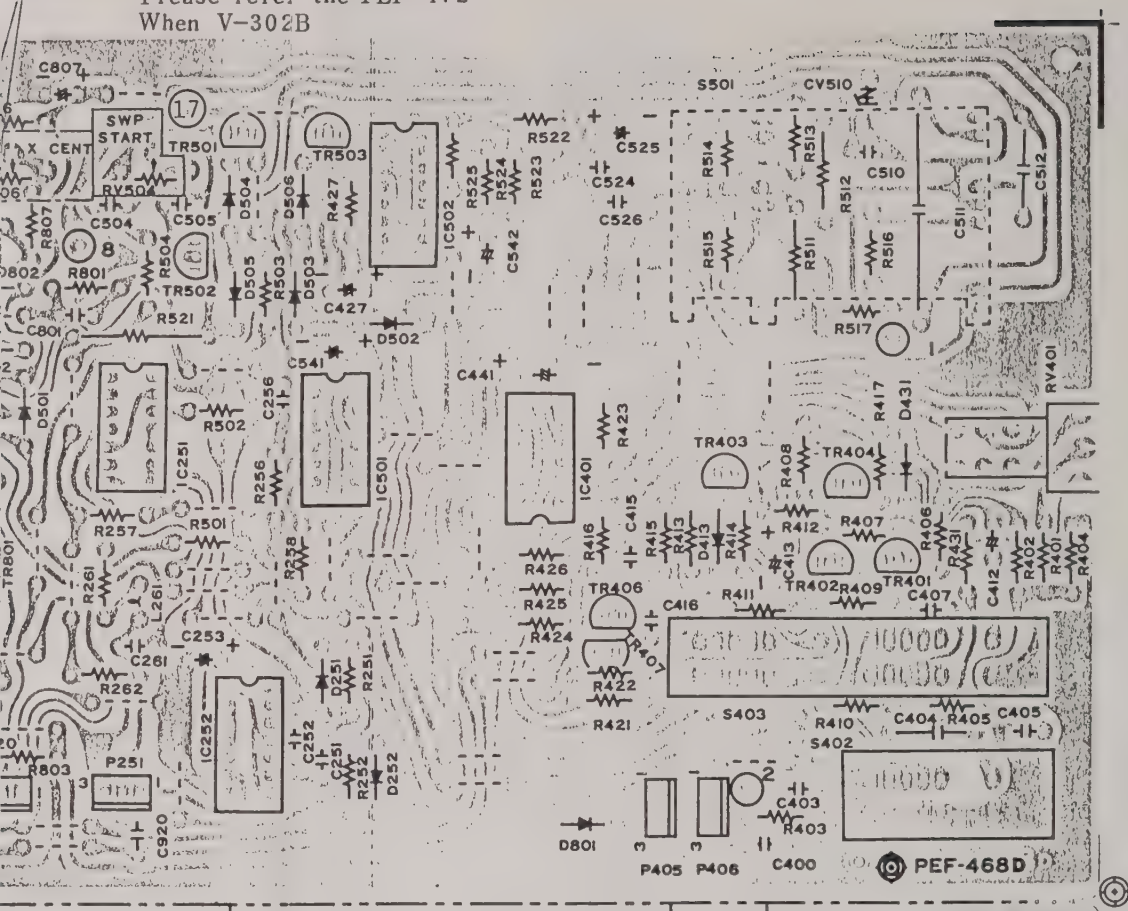

5
6
12
87
81
85
9
14
45
81
94
100
82
53
50
30
52
98
51
3
99
37
5
84
45
93
13
97
82
4
15
56
55
54
81
83
41
49

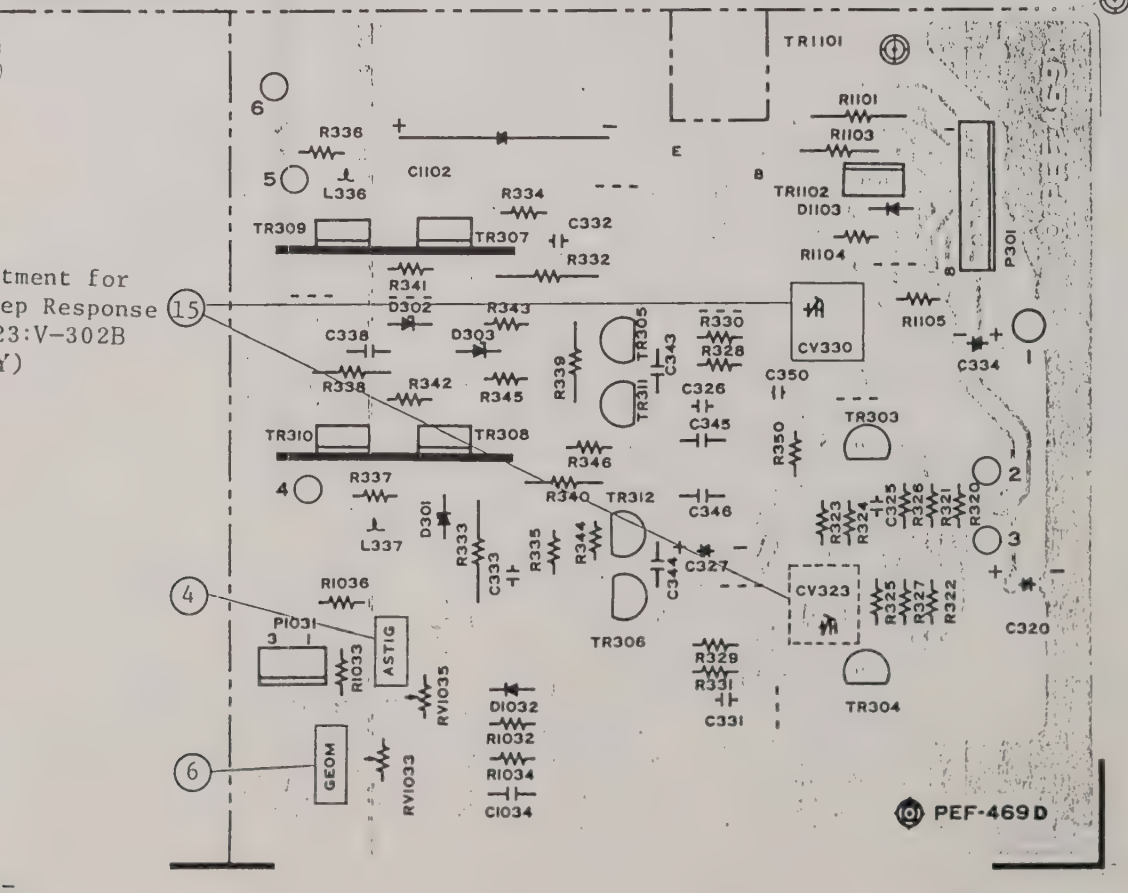

13 adjustment for Attn. Comp.
adjustment for Probe Comp.
14
7
8
11
12
DC BAL RV11
POS CENT RV44
CV1
CV2
CV3
CV4
CV42
S2-1F
S2-2F
CH1 GAIN RV43
RV29
RV51
S201
IC1
TR1
TR2
TR3
TR4
TR5
TR6
TR7
TR8
TR9
9
10
RV16 X5AC GAIN
RV18 X1AC GAIN
X5 AC GAIN RV116
RV118 X1 AC GAIN
RV151
RV129
TR105
IC101
CV101
CV102
CV103
CV104
S102-1F
S102-2F
TR101
TR102
TR103
TR104
TR106
TR107
RV144 POS CENT
RV143 CH2 GAIN
CV142
RV111 DC BAL
IC201
D201
D202
D203
D204
D211
D212
D213
D214
TR111
TR112
TR113
TR114
TR201
TR211
15 adjustment for V. Step Response (for V-302B)
PEF-467
13 adjustment for Attn. Comp.
7
8
11


15 adjustment for
V. Step Response
(CV42:V-302B ONLY)
HIGH VOLT DANGER
HV
HV ADJ
GRID BIAS
BAND
F1001
0.5A
PEF-467
3
2
2 H.V test point
PEF-467

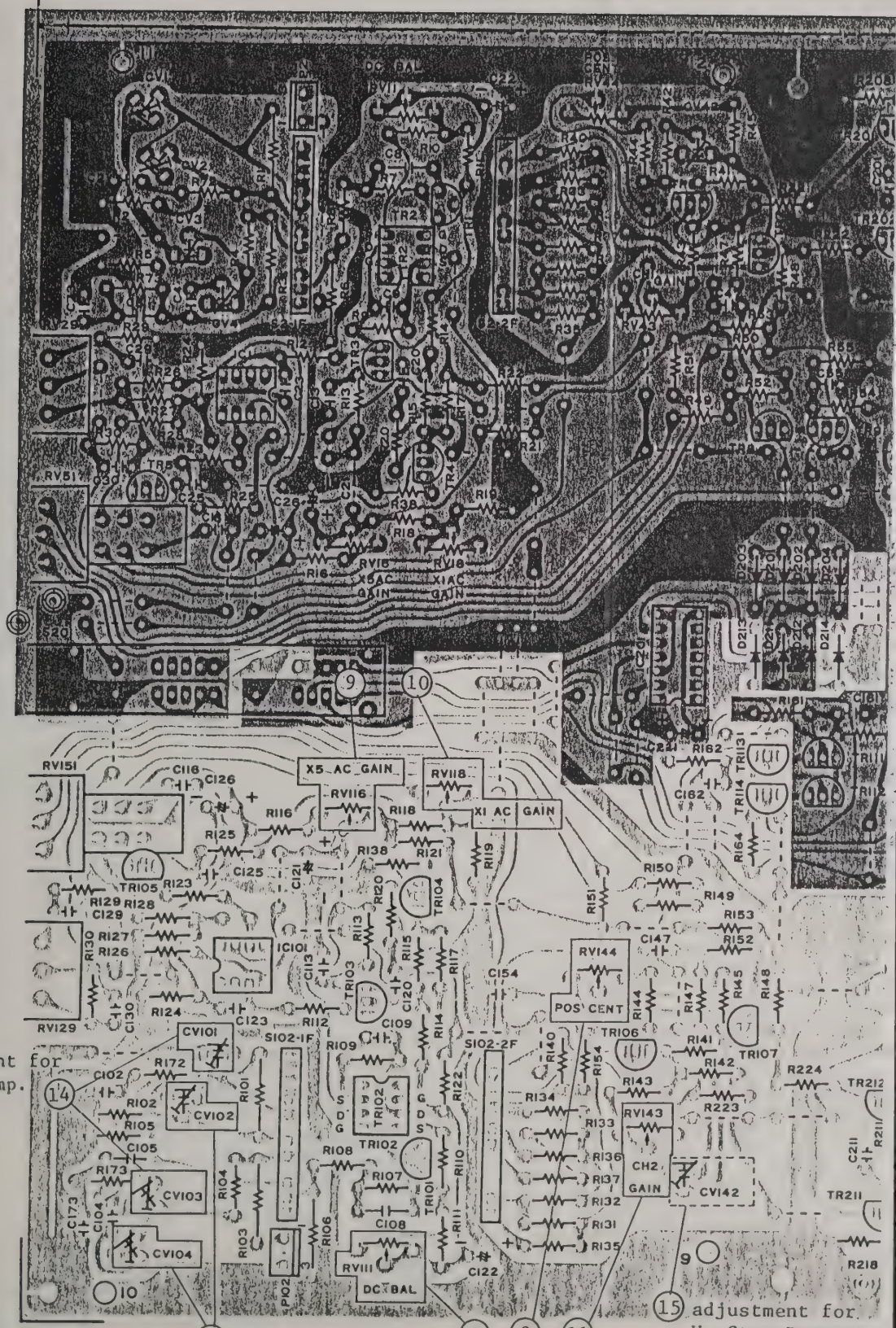

PEF-470D
PEF-471D
PEF-472D
PEF-473D
PEF-474D
PEF-468D
V-151
V-152
V-302
MAG GAIN
H GAIN
X GAIN
CAL
X-GAIN
X-CENT
1 CHANNEL ONLY
18
19
12 CAL voltage adjustment

(19) Note: Using for V-152B, 302B
Please refer the PEF-472
When V-302B





tment for
ep Response
23:V-302B
Y)

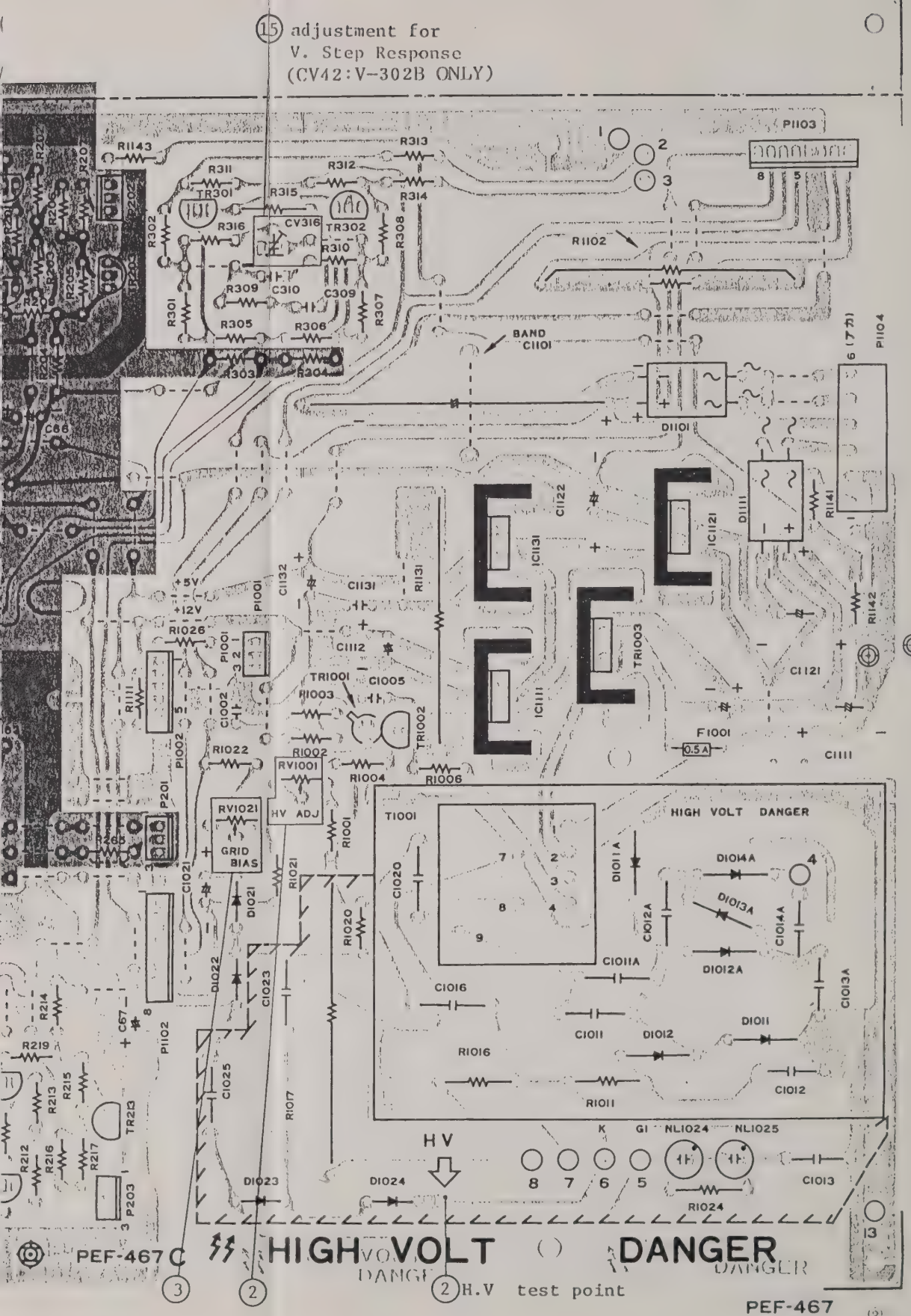


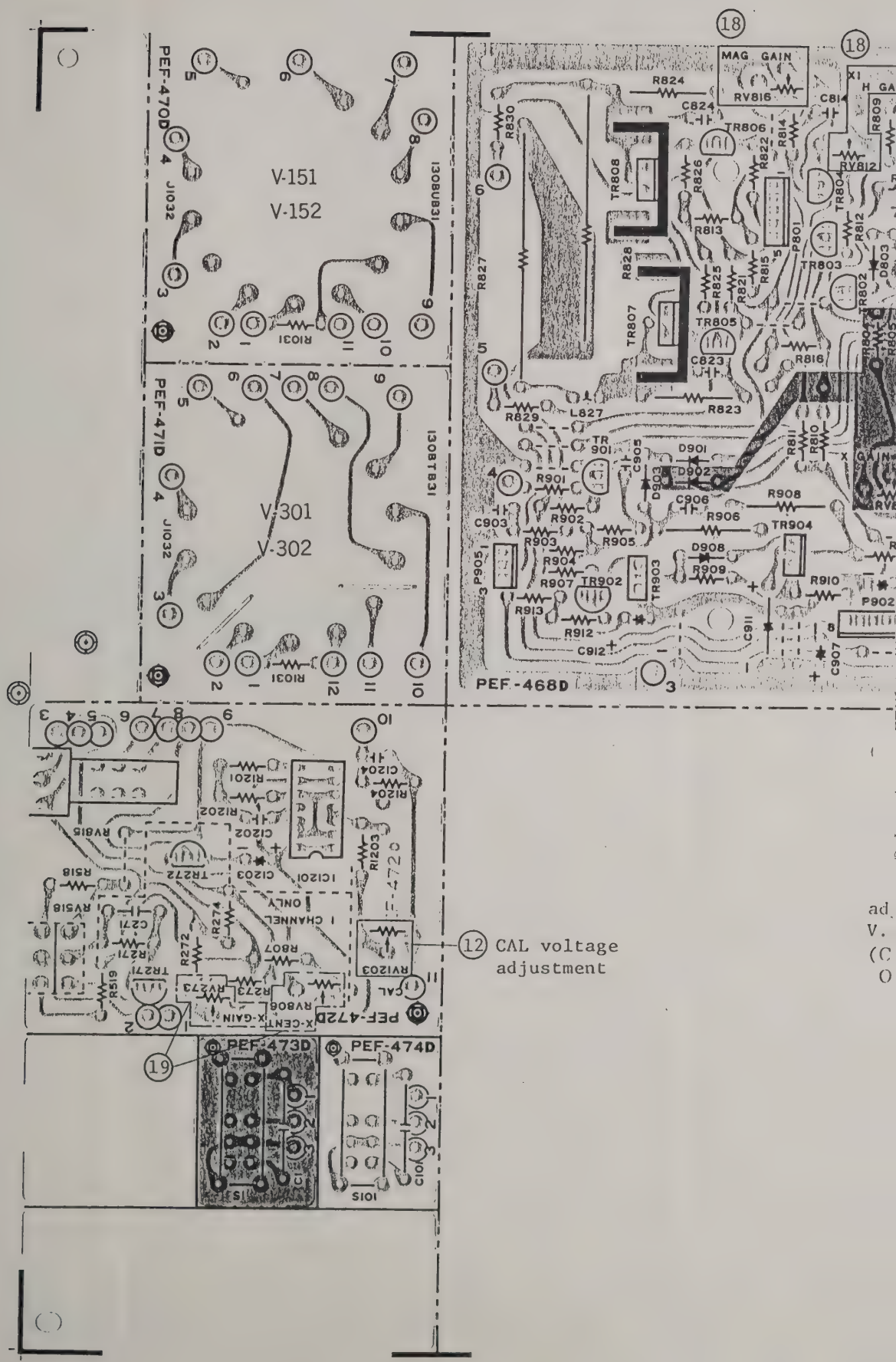
adjustment for Probe Comp.

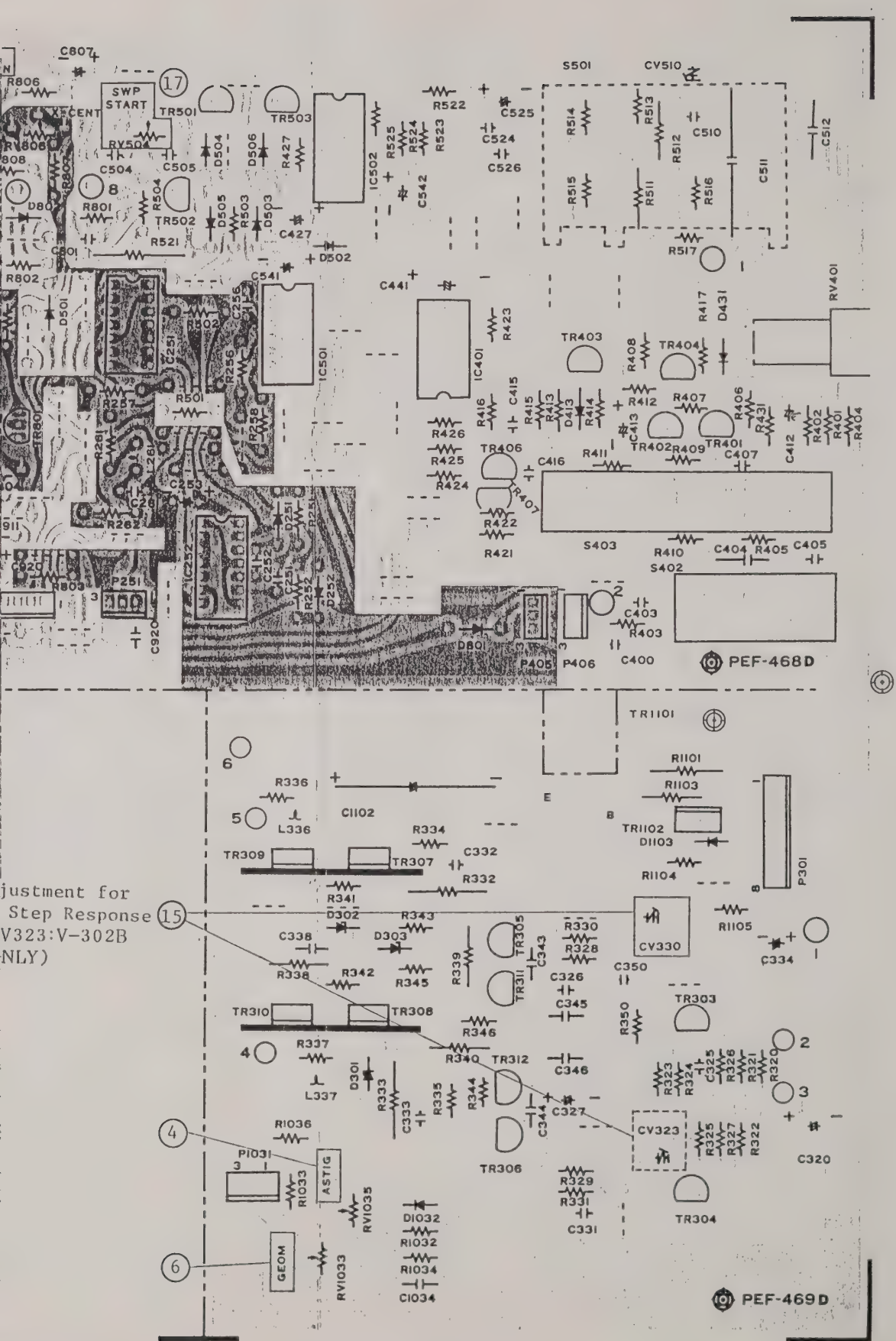
PEF-467

13 adjustment for Attn. Comp.

15 adjustment for V. Step Response (for V-302B)

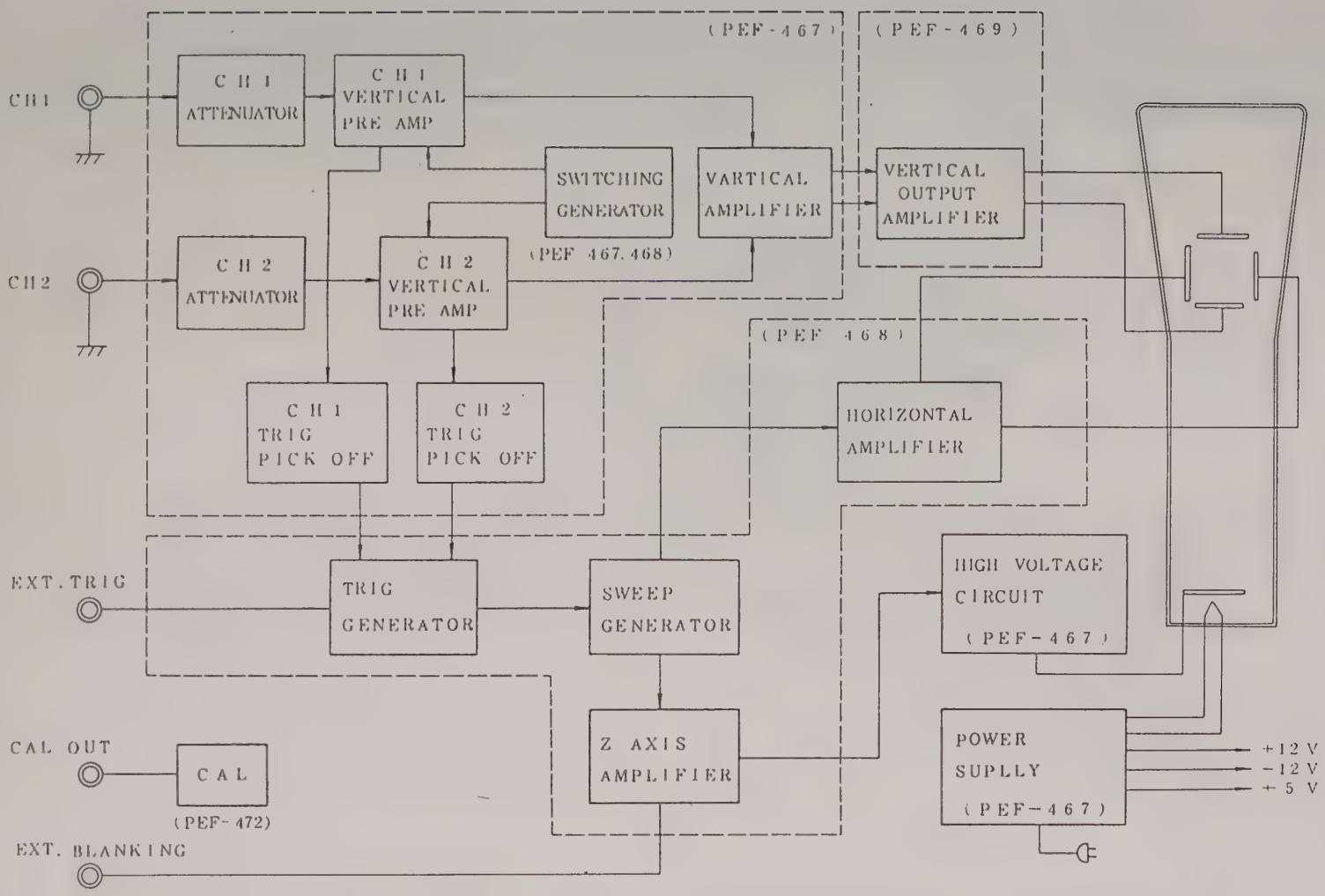

(15) adjustment for
V. Step Response
(CV42:V-302B ONLY)
HIGH VOLT DANGER
HV ADJ
GRID BIAS
BAND
HV
PEF-467
HIGH VOLT DANGER
(3)
(2)
(2) H.V test point
PEF-467


PEF-470D
V-151
V-152
PEF-471D
V-301
V-302
PEF-468D
PEF-472D
PEF-473D
PEF-474D
MAG GAIN
RV816
CAL
X-GAIN
X-CENT
ONLY
CHANNEL
12 CAL voltage adjustment
19

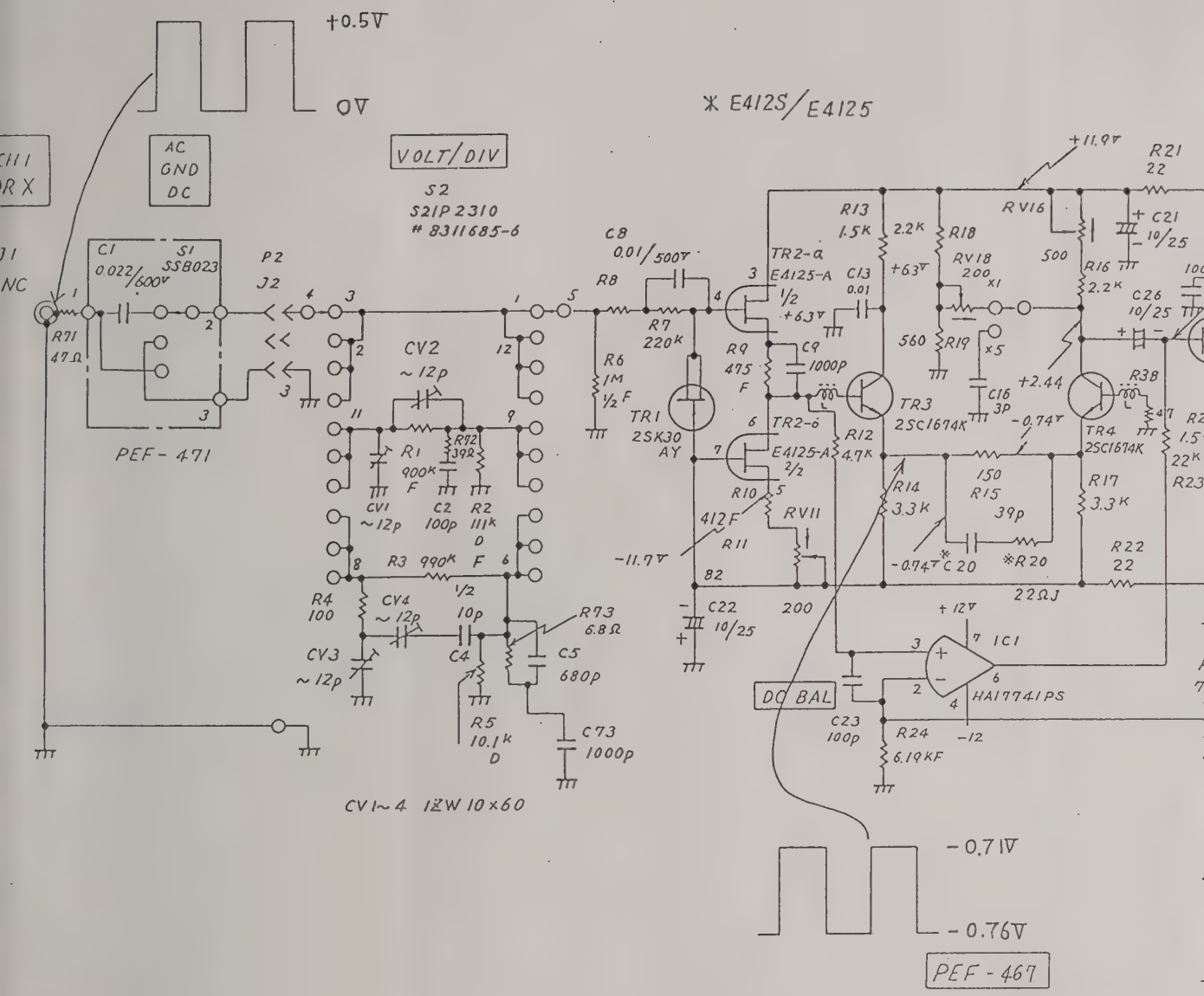

PEF-468D
PEF-469D
SWP START
ASTIG
GEOM
CV330
CV323
CV510
S501
S402
S403
TR1101
TR1102
P301
P405
P406
P251
P252
P2501
P1031
RV1035
RV1033
RV401
RV504
TR501
TR502
TR503
TR303
TR304
TR306
TR307
TR308
TR309
TR310
TR311
TR312
TR401
TR402
TR403
TR404
TR406
IC401
IC501
IC502
IC1252
D1103
D1032
D1034
D1036
D1037
D1038
D1039
D1040
D1041
D1042
D1043
D1044
D1045
D1046
D1047
D1048
D1049
D1050
D1051
D1052
D1053
D1054
D1055
D1056
D1057
D1058
D1059
D1060
D1061
D1062
D1063
D1064
D1065
D1066
D1067
D1068
D1069
D1070
D1071
D1072
D1073
D1074
D1075

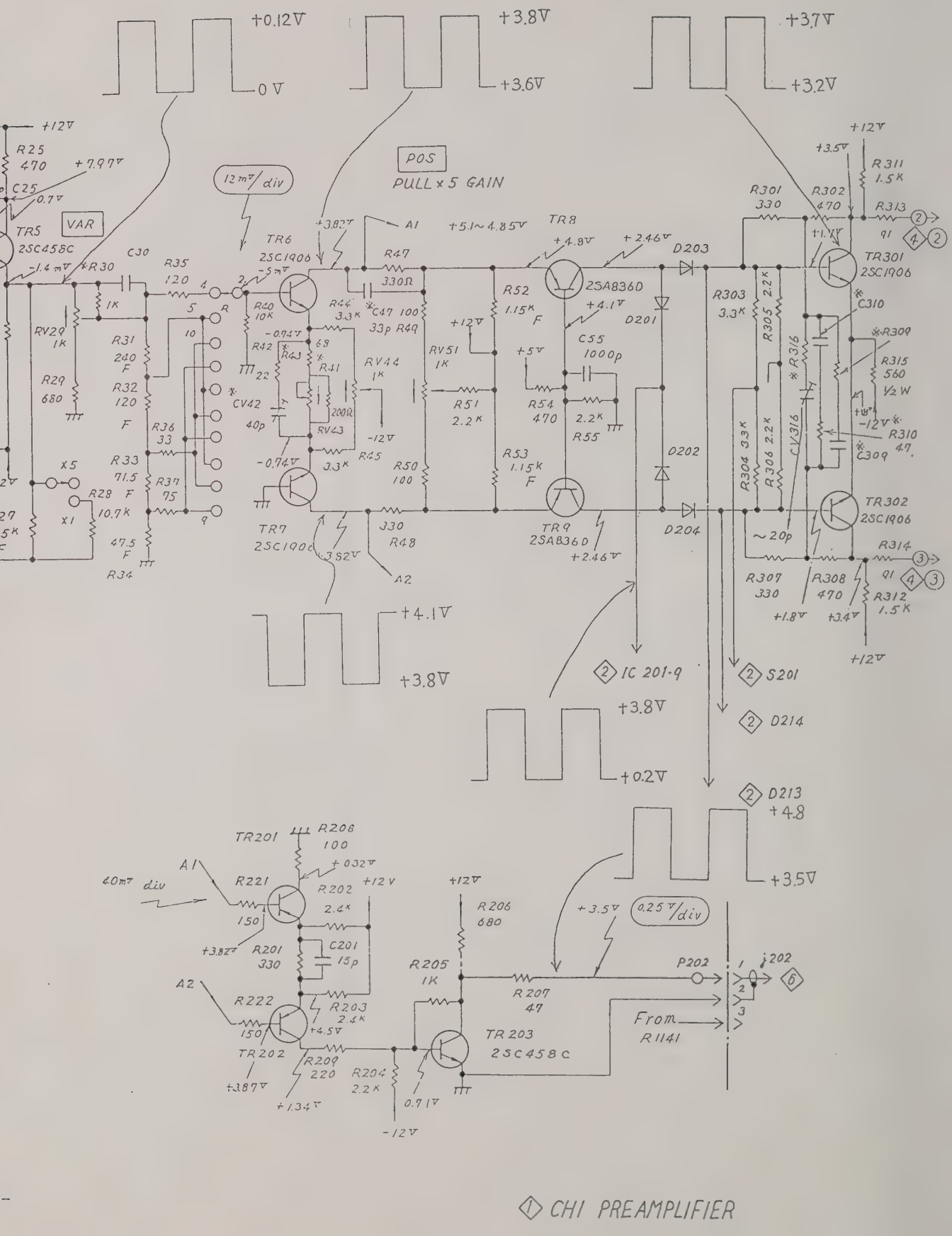
DIAGRAM

※ : Refer to ELECTRIC PARTS LIST, when this symbol is remarked.

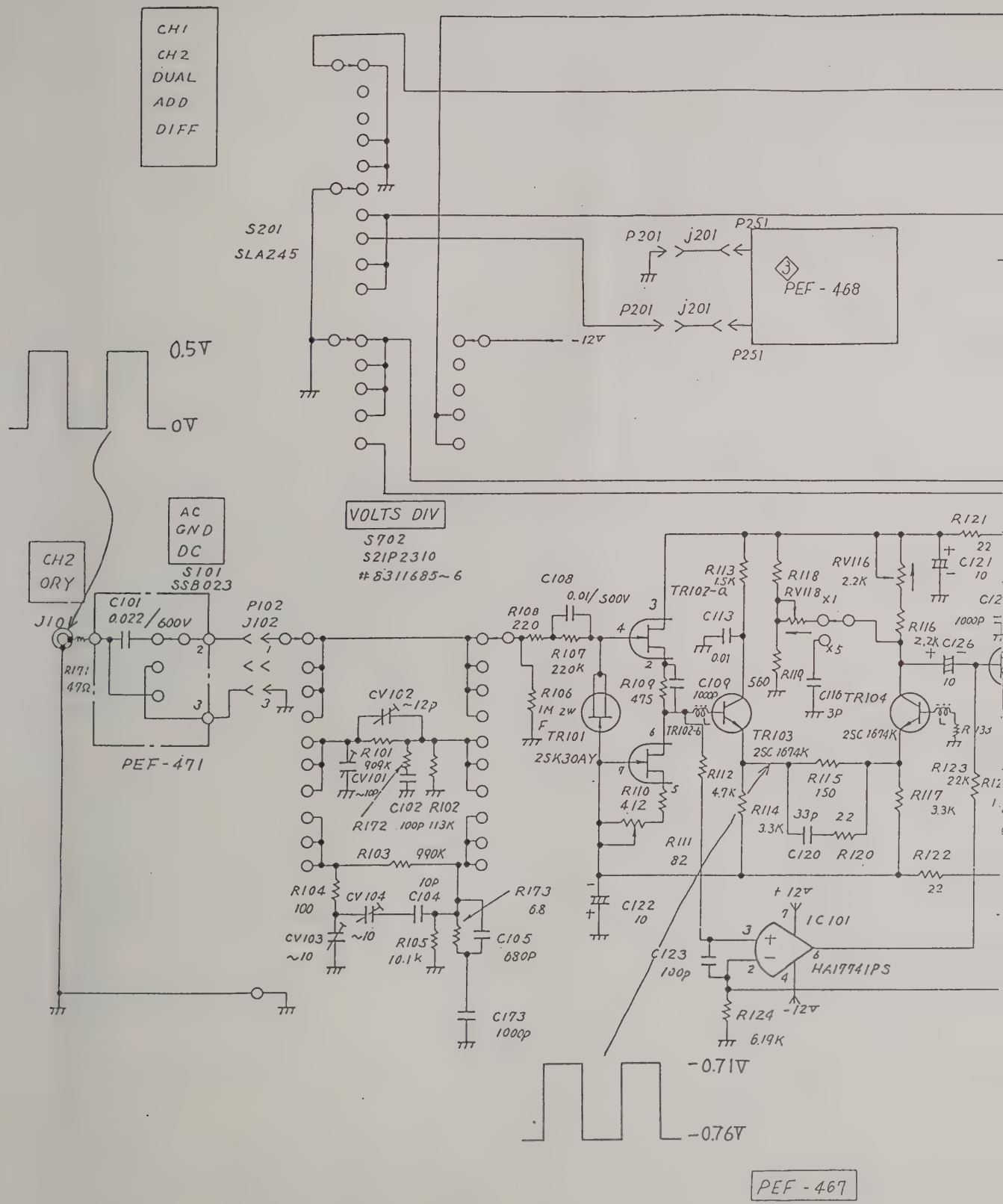


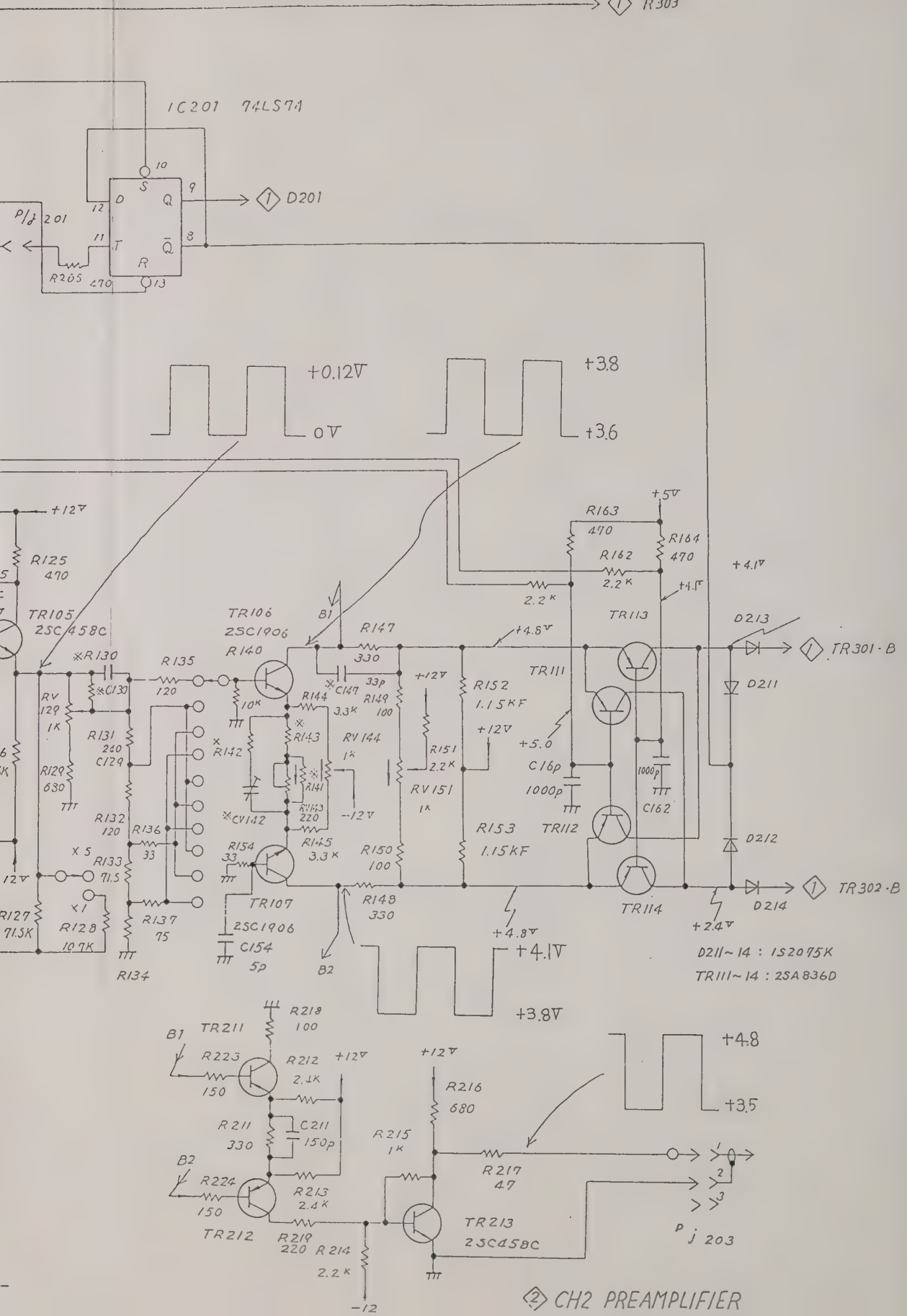
BLOCK DIAGRAM

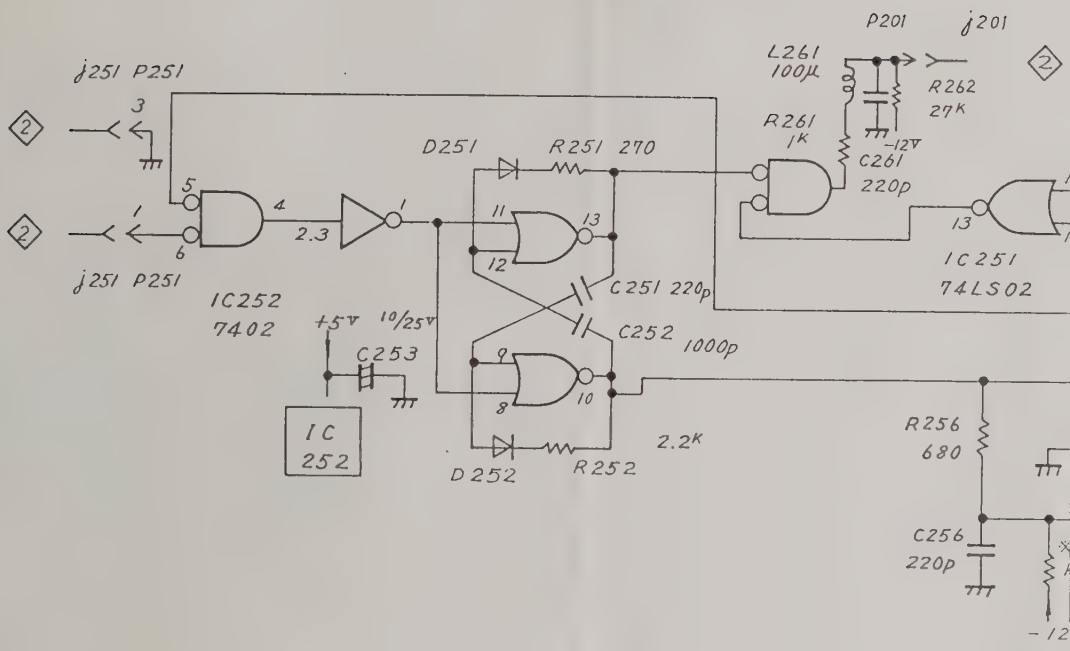

+0.5V
0V
AC
GND
DC
VOLT/DIV
S2
S21P2310
8311685-6
* E412S/E4125
C1
0.022/600V
S1
SSB023
P2
J2
R71
47Ω
PEF-471
CV2
~12p
R1
900K
F
R72
39Ω
C2
100p
R2
111K
D
CV1
~12p
R3
990K
F
CV4
~12p
CV3
~12p
R4
100
1/2
10p
C4
R5
10.1K
D
R73
6.8Ω
C5
680p
C73
1000p
CV1~4 1/2W 10×60
C8
0.01/500V
R8
R7
220K
R6
1M
1/2F
TR1
2SK30
AY
TR2-a
E4125-A
1/2
TR2-b
E4125-A
1/2
C13
0.01
+6.3V
R9
475
F
C9
1000p
R10
412F
R11
RV11
-11.7V
R12
4.7K
R13
1.5K
2.2K
+6.3V
R14
3.3K
C22
10/25
82
200
TR3
2SC1674K
-0.74V
R18
RV18
200
x1
560
R19
x5
C16
3P
RV16
500
R16
2.2K
+2.44
TR4
2SC1674K
-0.74V
150
R15
39p
*C20
*R20
R17
3.3K
R22
22
22ΩJ
+11.9V
R21
22
C21
10/25
C26
10/25
R38
22K
R23
+12V
IC1
HA17741PS
DC BAL
C23
100p
R24
6.19KF
-12
-0.71V
-0.76V
PEF-467

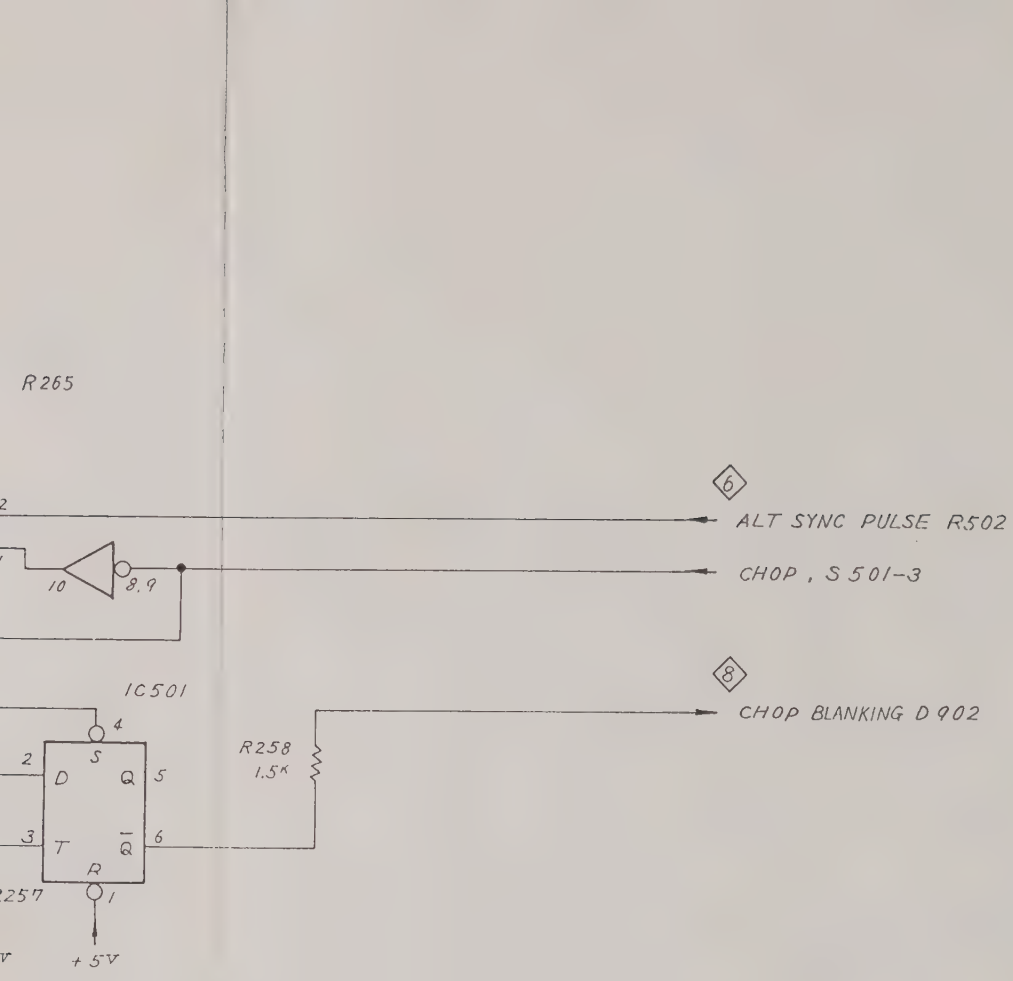


1 CH1 PREAMPLIFIER


CH1
CH2
DUAL
ADD
DIFF
S201
SLA245
P201
J201
P251
PEF - 468
-12V
0.5V
0V
AC
GND
DC
S101
SSB023
CH2
ORY
J101
C101
0.022/600V
P102
J102
R171
47Ω
PEF-471
VOLTS DIV
S702
S21P2310
#8311685~6
C108
0.01/500V
R108
220
R107
220K
R106
1M 2W
F
TR101
2SK30AY
CV102
~12p
R101
909K
CV101
~100
C102
R102
R172
100P 113K
R103
990K
R104
100
CV104
10P
C104
R173
6.8
CV103
~10
R105
10.1K
C105
680P
C173
1000P
TR102-a
TR102-b
R109
475
C109
1000
R110
4.12
R111
82
C122
10
R112
4.7K
R113
1.5K
C113
0.01
R114
3.3K
R115
150
33P
C120
22
R120
R118
RV118
x1
x5
R119
560
C116
3P
TR103
2SC 1674K
TR104
2SC 1674K
RV116
2.2K
R116
2.2K
C126
10
R121
22
C121
10
R123
22K
R117
3.3K
R122
22
+12V
IC 101
HA17741PS
C123
100P
R124
6.19K
-12V
-0.71V
-0.76V
PEF-467


IC201 74LS74
D201
R303
R205 470
+0.12V
0V
+3.8
+3.6
+12V
R125 470
TR105 2SC458C
※R130
R135 120
TR106 2SC1906
R140
B1
R147 330
+4.8V
R163 470
R164 470
R162 2.2K
+5V
+4.1V
TR113
D213
TR301·B
D211
TR111
R152 1.15KF
R153 1.15KF
TR112
TR114
D212
D214
TR302·B
+2.4V
C16p 1000p
1000p
C162
+5.0
R151 2.2K
RV151 1K
RV144 1K
R144 3.3K
R149 100
R150 100
R148 330
R154 33
TR107 2SC1906
C154 5p
R145 3.3K
R141 220
R143 220
※R142
※CV142
※C147 33p
※C130
RV129 1K
R131 240
C129
R129 630
R132 120
R136 33
R133 91.5
R128 10.7K
R137 75
R134
R127 71.5K
X5
X1
B2
+4.8V
+4.1V
+3.8V
D211~14 : 1S2075K
TR111~14 : 2SA836D
TR211
R218 100
R223 150
R212 2.1K
R211 330
C211 150p
R224 150
R213 2.4K
TR212
R219 220
R214 2.2K
-12
R216 680
R215 1K
R217 47
TR213 2SC458C
+4.8
+3.5
P j 203
② CH2 PREAMPLIFIER

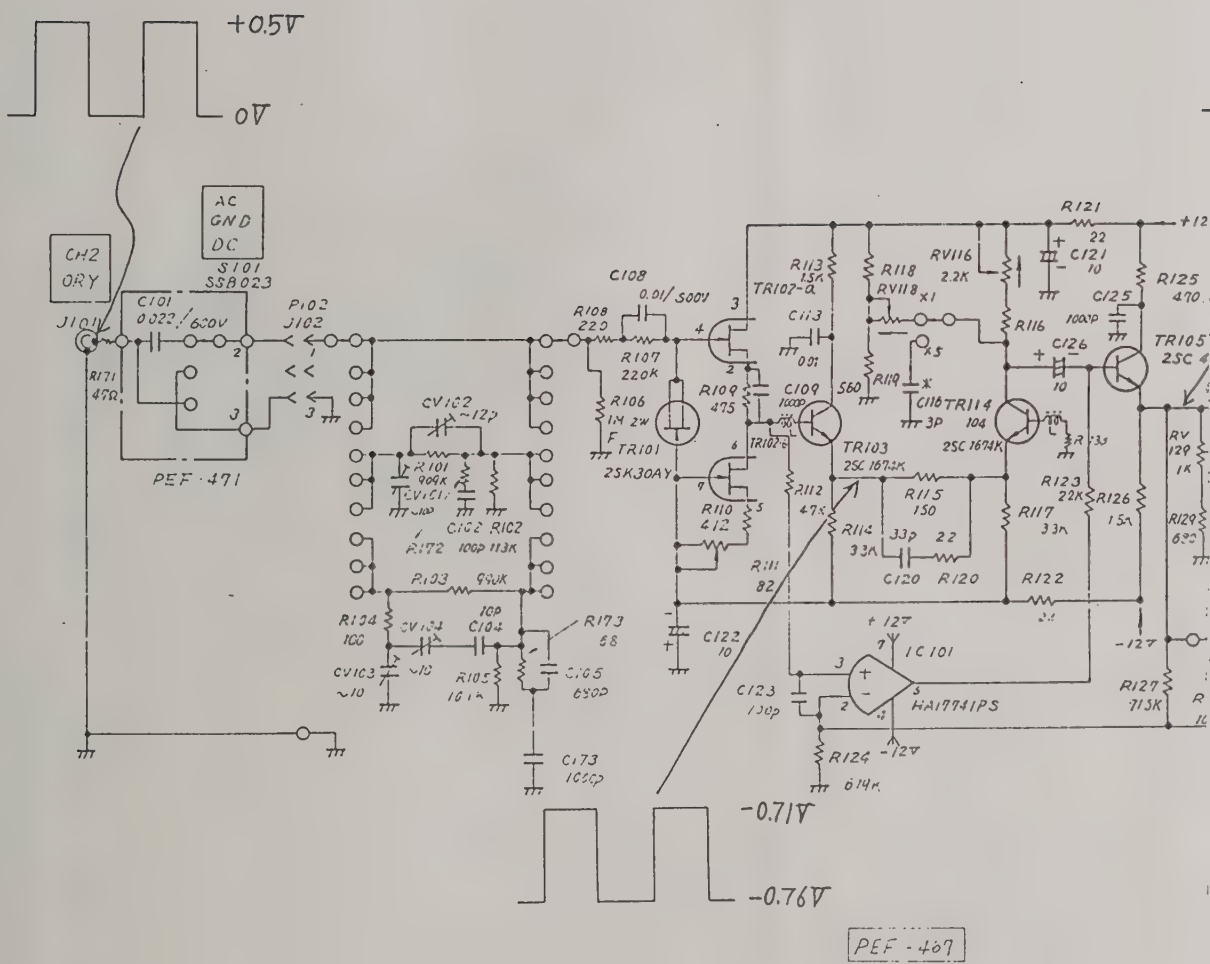

j251 P251
3
2
1
5
6
4
2.3
1
j251 P251
IC252
7402
+5V
10/25V
C253
IC
252
D251
R251 270
11
13
12
C251 220p
C252 1000p
9
10
8
D252
R252
2.2K
P201
j201
L261
100μ
R262
27K
R261
1K
C261
220p
-12V
13
IC 251
74LS02
R256
680
C256
220p
-12

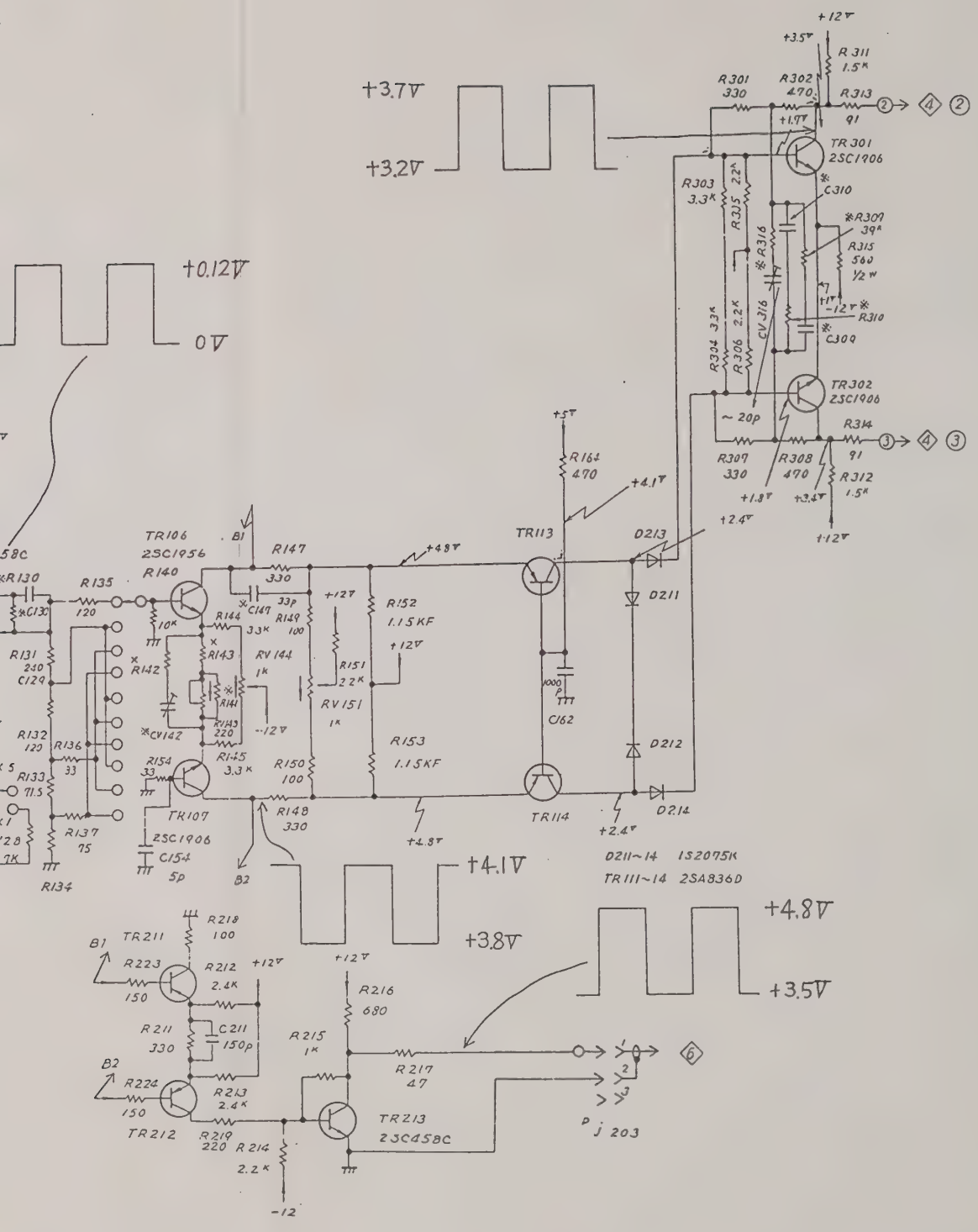


PEF-468

FOR THE DUAL TRACE OSCILLOSCOPE

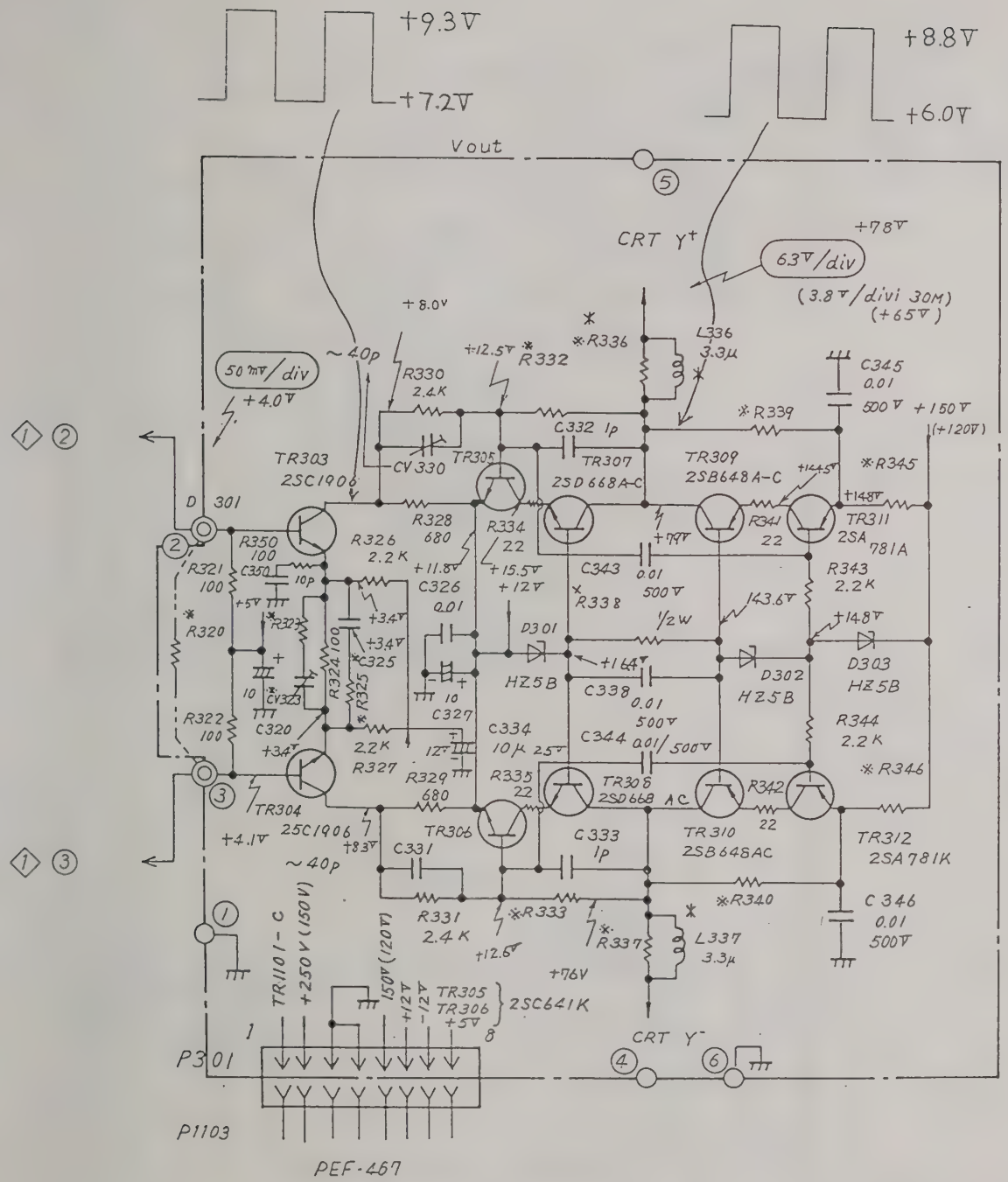
③ VERTICAL SWITCHING


+0.5V
0V
AC
GND
DC
S101
SSB023
CH2
ORY
J101
C101
0.022/630V
P102
J102
R171
47Ω
PEF-471
CV102
~12p
R101
909K
CV101
~10
C102
100P
R102
113K
R172
R103
99.5K
R104
100
CV104
10P
C104
CV103
~10
R105
16.1K
R173
68
C105
650P
C173
100P
C108
0.01/500V
R108
220
R107
220K
TR101
2SK30AY
R106
1M 2W
F
TR102-a
TR102-b
R109
475
C109
1000P
R110
412
R112
47K
R111
82
C122
10
C113
0.01
R113
15K
TR103
2SC1674K
R114
33K
C120
33P
R120
22
R115
150
R118
RV118
2.2K
x1
x5
x1
C119
3P
R119
560
TR114
2SC1674K
R116
C126
10
C121
10
R121
22
C125
1000P
R117
33K
R123
22K
R126
15K
R122
3.3K
RV129
1K
R129
680
TR105
2SC
+12V
-12V
IC101
HA17741PS
C123
130P
R124
614K
R127
715K
-0.71V
-0.76V
PEF-467

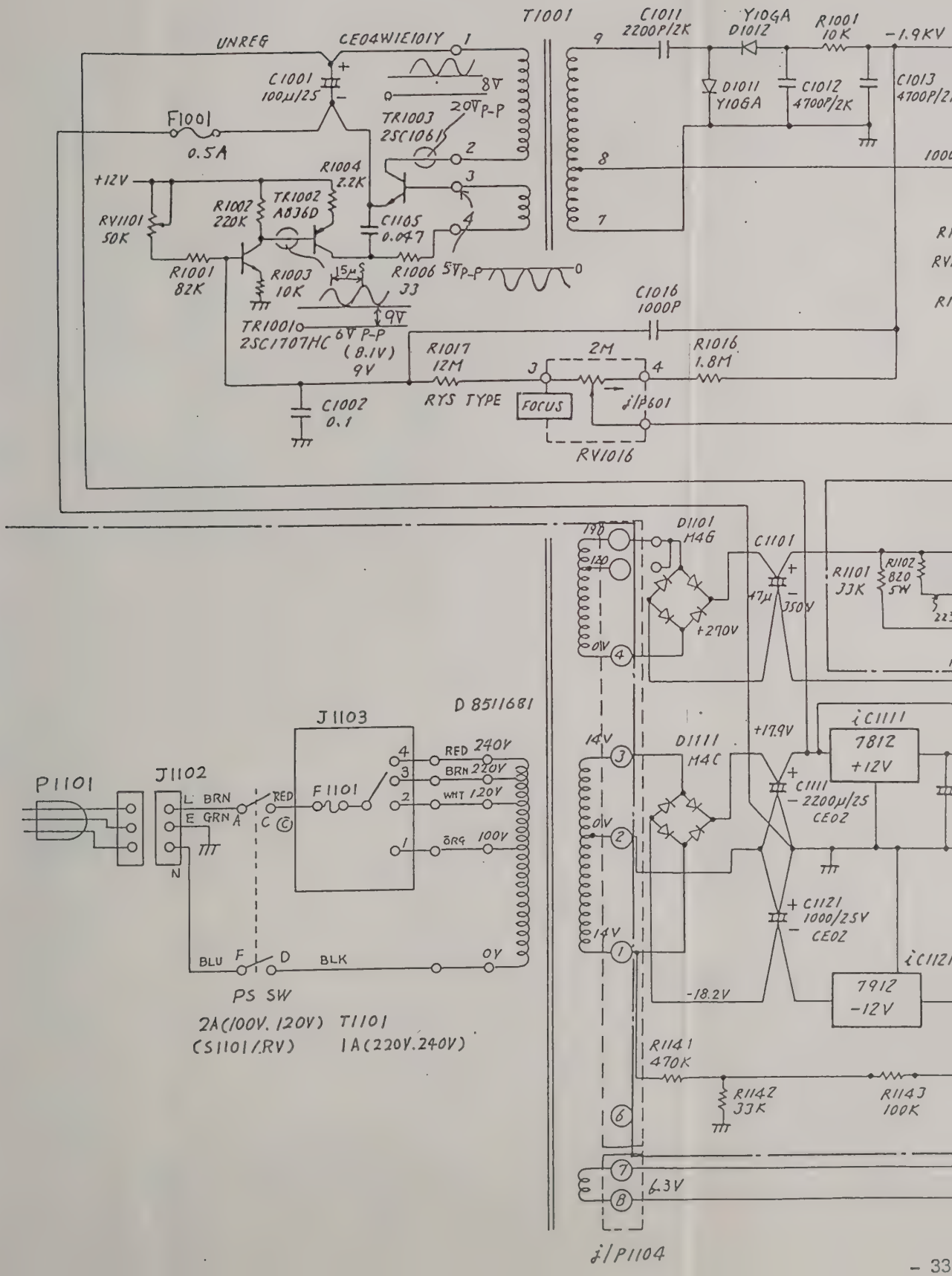


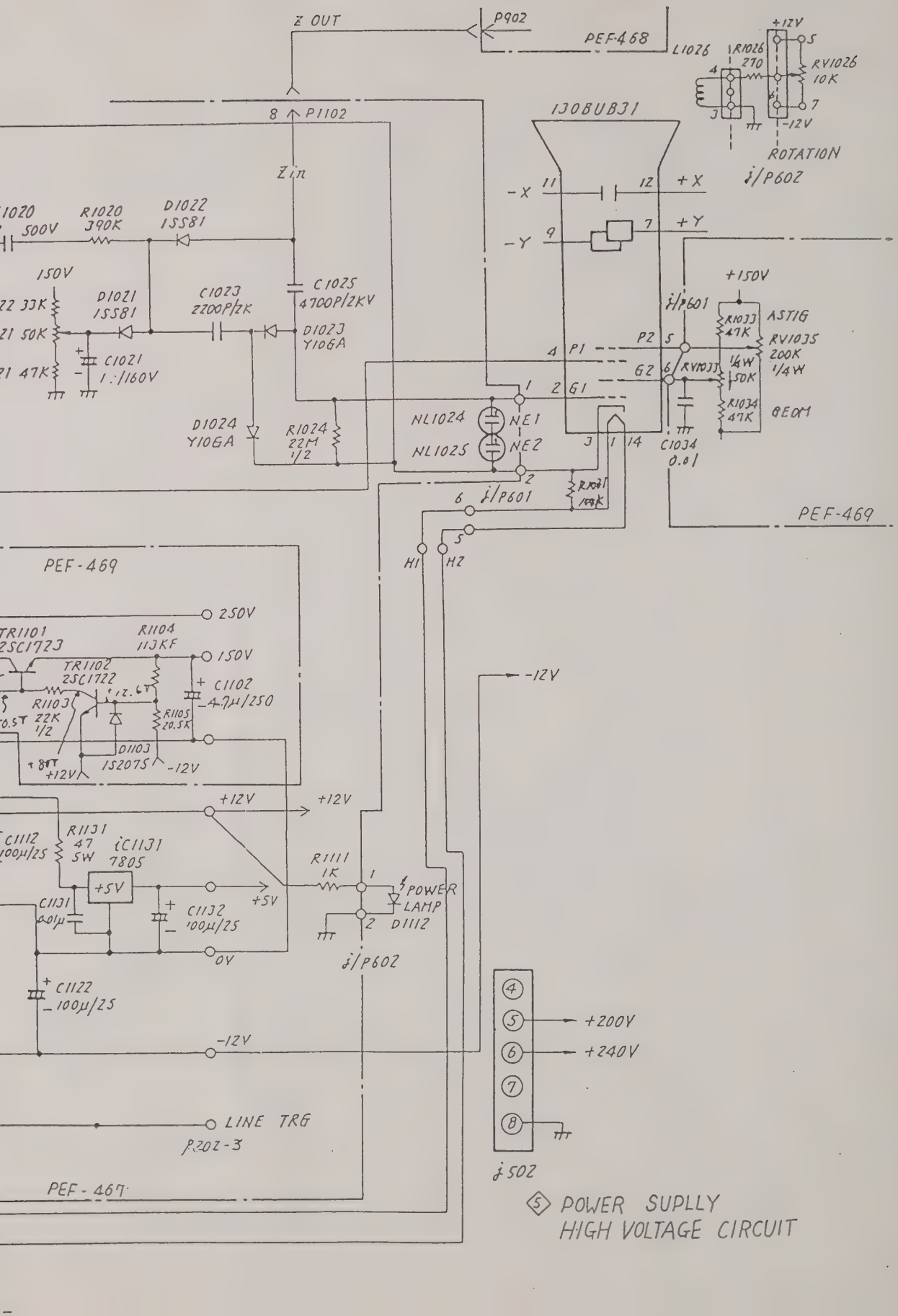
FOR THE SINGLE TRACE OSCILLO SCOPE

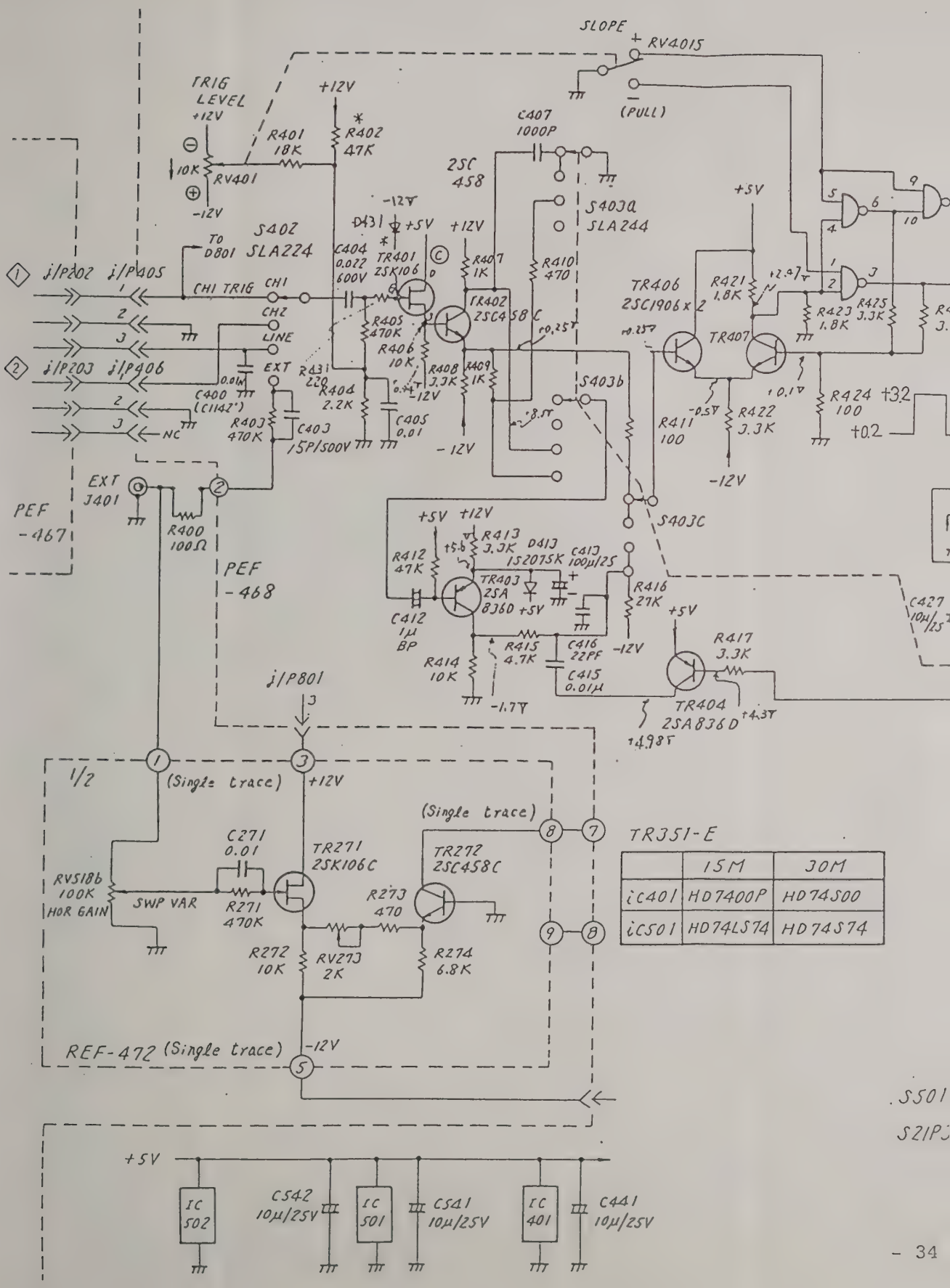
② CH2 PREAMPLIFIER

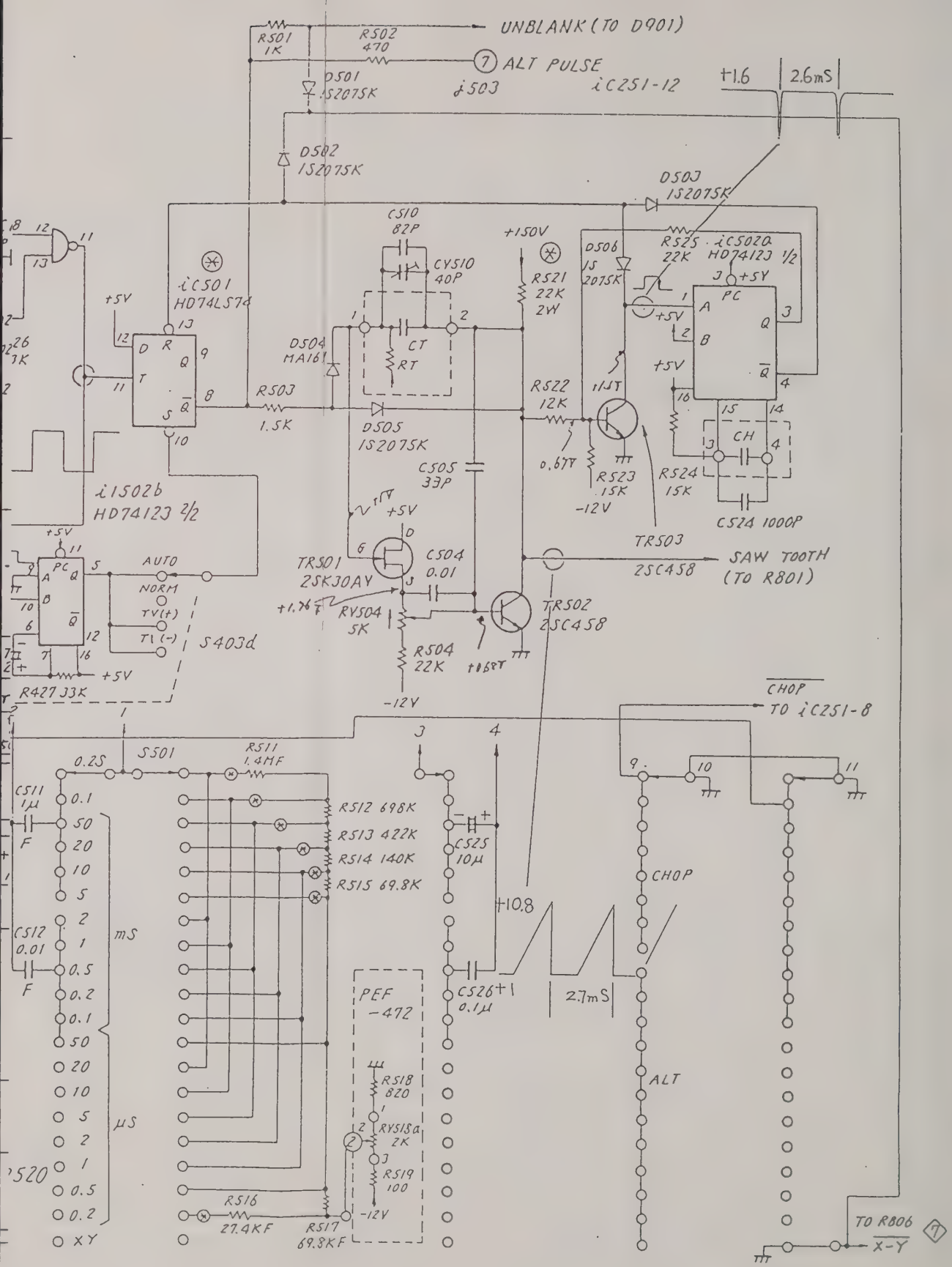


④ VERTICAL OUTPUT AMPLIFIER

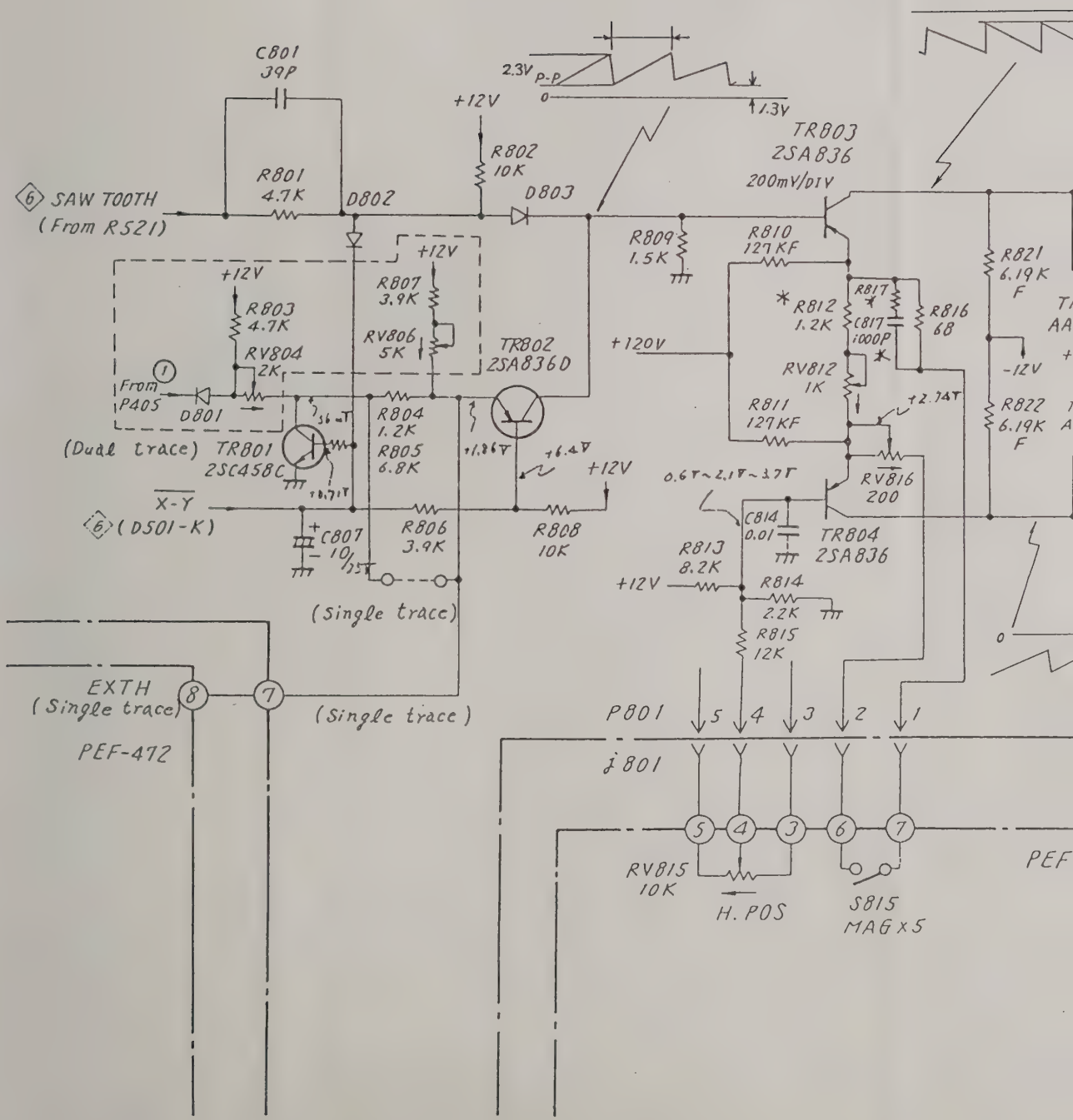

T1001
UNREG
CE04W1E101Y
C1001 100μ/25
F1001 0.5A
TR1003 2SC1061S
8V
20V P-P
R1004 2.2K
+12V
RV1101 50K
R1002 220K
TR1002 A836D
C1105 0.047
R1001 82K
R1003 10K
15μS
R1006 33
5V P-P
TR1001 2SC1707HC
6V P-P (8.1V) 9V
9V
C1002 0.1
C1011 2200P/2K
Y106A D1012
R1001 10K
-1.9KV
D1011 Y106A
C1012 4700P/2K
C1013 4700P/2
C1016 1000P
R1017 12M
RYS TYPE
2M
FOCUS
R1016 1.8M
i/P601
RV1016
D 8511681
J1103
J1102
P1101
L BRN
E GRN
N
RED
F1101
RED 240V
BRN 220V
WHT 120V
ORG 100V
BLU
BLK
0V
PS SW
2A(100V. 120V) T1101
(S1101/RV) 1A(220V. 240V)
D1101 M4G
C1101 47μ 350V
+270V
R1101 JJK
R1102 820 5W
D1111 M4C
+17.9V
i C1111
7812 +12V
C1111 2200μ/25 CE02
C1121 1000/25V CE02
-18.2V
7912 -12V
R1141 470K
R1142 JJK
R1143 100K
6.3V
i/P1104

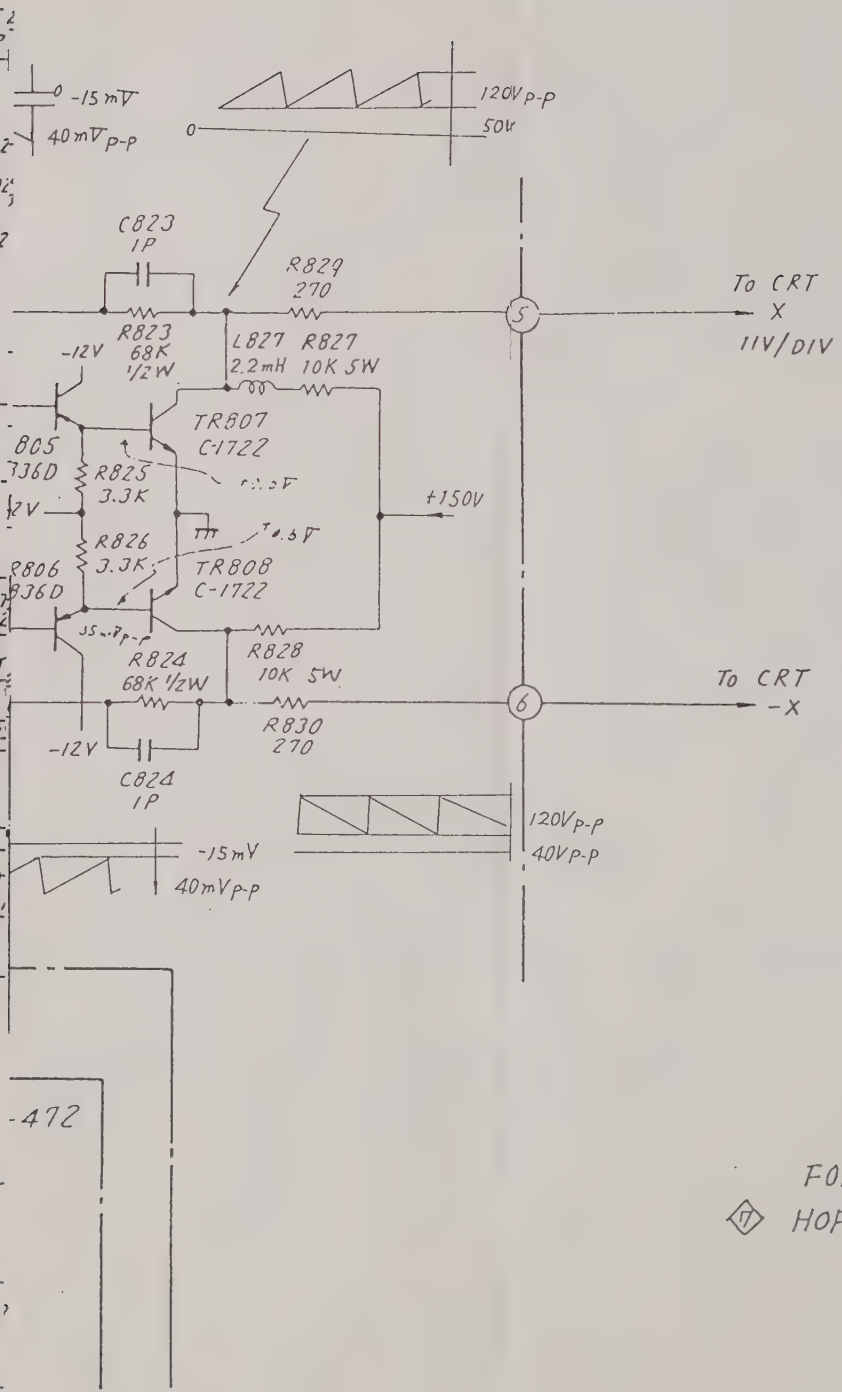

Z OUT
P902
PEF-468
L1026
R1026 270
RV1026 10K
+12V
-12V
ROTATION
8 P1102
Z in
130BUB31
-X
+X
-Y
+Y
i/P602
R1020 390K
D1022 1SS81
500V
150V
D1021 1SS81
C1023 2200P/2K
C1025 4700P/2KV
D1023 Y10GA
C1021 1.5/160V
D1024 Y10GA
R1024 22M 1/2
NL1024
NL1025
NE1
NE2
G1
G2
P1
P2
+150V
i/P601
RV1033 47K
ASTIG
RV1035 200K 1/4W
R1034 47K
BEAM
C1034 0.01
PEF-469
H1
H2
250V
TR1101 2SC1723
R1104 113KF
150V
TR1102 2SC1722
C1102 4.7μ/250
R1103 22K 1/2
R1105 20.5K
D1103 1S2075
+12V
-12V
R1131 47 5W
IC1131 7805
+5V
C1131 .01μ
C1132 100μ/25
C1122 100μ/25
0V
R1111 1K
POWER LAMP
D1112
LINE TRG
P202-3
PEF-467
+200V
+240V
J502
⑤ POWER SUPLLY
HIGH VOLTAGE CIRCUIT


SLOPE
RV4015
(PULL)
TRIG LEVEL
+12V
R401 18K
R402 47K
RV401 10K
-12V
S402 SLA224
To D801
j/P202 j/P405
CH1 TRIG
CH1
CH2
LINE
EXT
j/P203 j/P406
NC
C400 (C1142')
R403 470K
C403 15P/500V
C404 0.022 600V
TR401 2SK106
D431
R431 220
R404 2.2K
C405 0.01
R405 470K
R406 10K
TR402 2SC458C
R407 1K
R408 3.3K
R409 1K
R410 470
2SC 458
C407 1000P
S403a SLA244
S403b
S403c
EXT J401
R400 100Ω
PEF -467
PEF -468
R412 47K
R413 3.3K
D413 1S2075K
C413 100μ/25
TR403 2SA 836D
C412 1μ BP
R414 10K
R415 4.7K
C416 22PF
C415 0.01μ
R416 27K
R417 3.3K
TR404 2SA836D
TR406 2SC1906 x 2
TR407
R421 1.8K
R423 1.8K
R425 3.3K
R422 3.3K
R411 100
R424 100
C427 10μ/25
j/P801
1/2
(Single trace)
+12V
C271 0.01
TR271 2SK106C
TR272 2SC458C
RV518b 100K HOR GAIN
SWP VAR
R271 470K
R273 470
R272 10K
RV273 2K
R274 6.8K
REF-472 (Single trace)
-12V
TR351-E
	15M	30M
iC401	HD7400P	HD74S00
iC501	HD74LS74	HD74S74
S501
S21PJ
+5V
IC 502
C542 10μ/25V
IC 501
C541 10μ/25V
IC 401
C441 10μ/25V

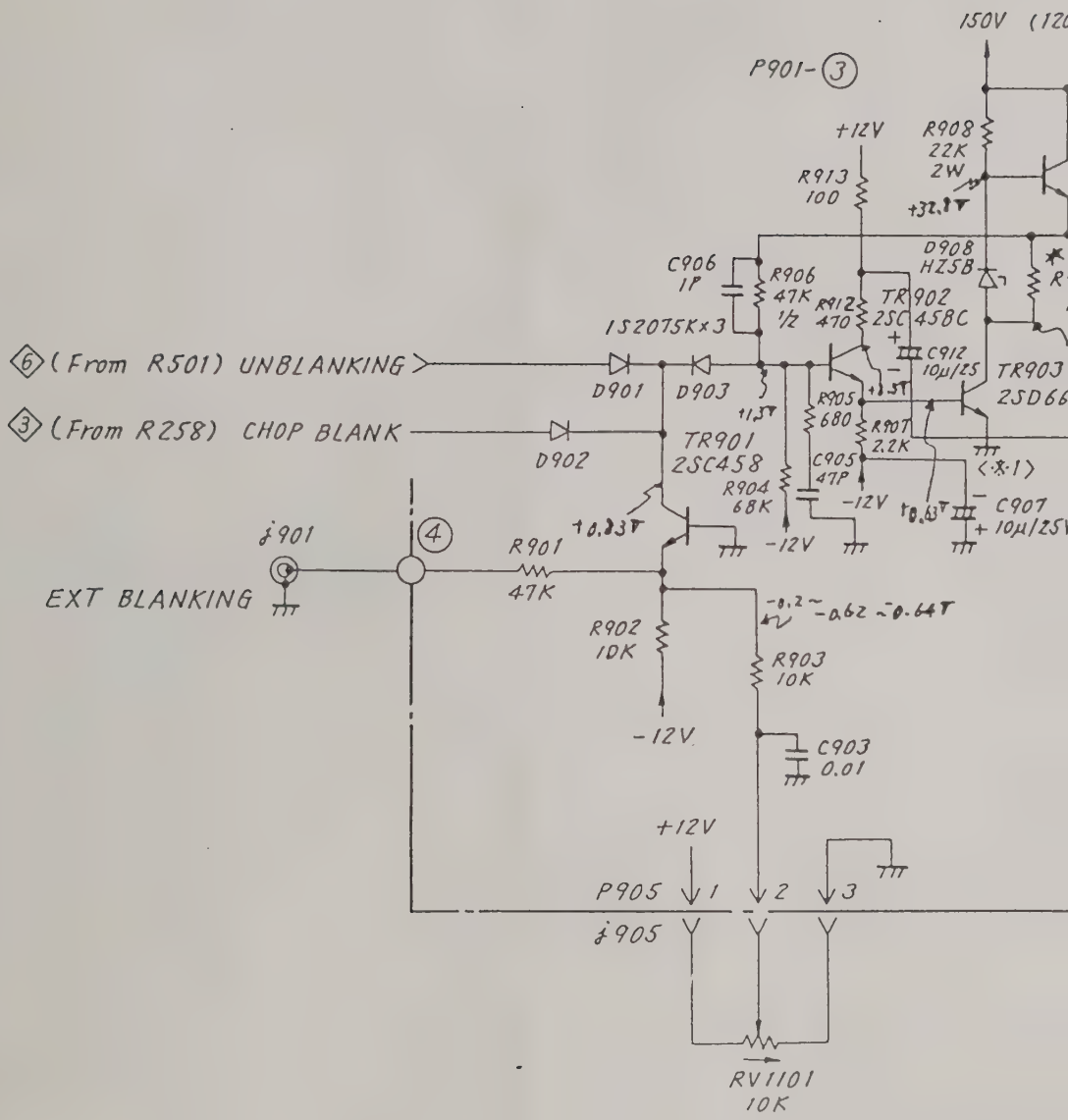


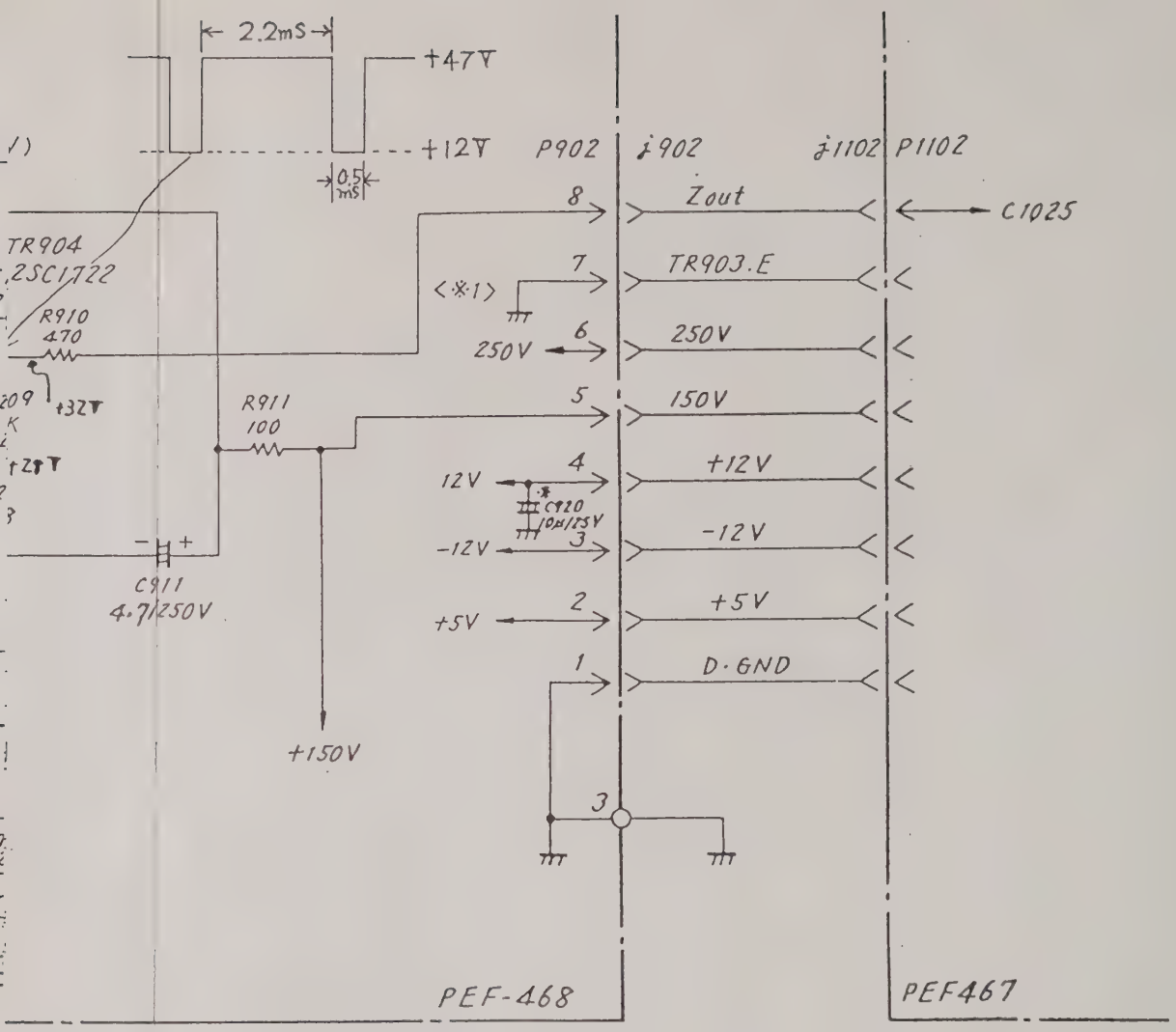
⑥ SWEEP GENERATOR & TRIG


C801
39P
2.3V P-P
0
1.3V
+12V
R802
10K
TR803
2SA836
200mV/DIV
6 SAW TOOTH
(From R521)
R801
4.7K
D802
D803
R809
1.5K
R810
127KF
R821
6.19K
F
+12V
R807
3.9K
R803
4.7K
RV806
5K
RV804
2K
TR802
2SA836D
R812
1.2K
R817
C817
1000P
R816
68
+120V
RV812
1K
-12V
R822
6.19K
F
1
From
P405
D801
R804
1.2K
R805
6.8K
+1.26V
+6.4V
+12V
R811
127KF
+2.74V
(Dual trace) TR801
2SC458C
RV816
200
0.6V~2.1V~3.7V
X-Y
6 (D501-K)
C807
10/25V
R806
3.9K
R808
10K
C814
0.01
TR804
2SA836
R813
8.2K
+12V
R814
2.2K
R815
12K
(Single trace)
EXTH
(Single trace)
8
7
(Single trace)
PEF-472
P801
5
4
3
2
1
J801
5
4
3
6
7
RV815
10K
H. POS
S815
MAG x5
PEF



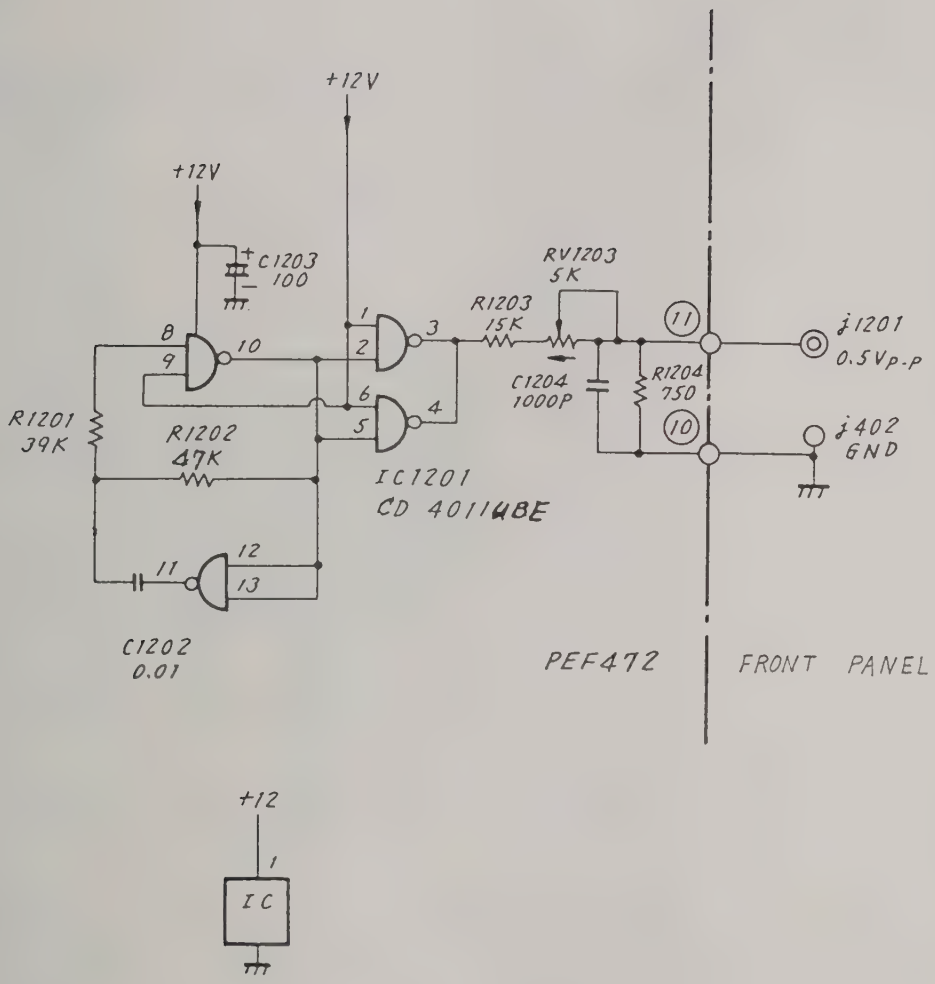
FOR V-151B, V-152B
⑰ HORIZONTAL AMPLIFIER


150V
P901-③
+12V
R908
22K
2W
R913
100
C906
1P
R906
47K
1/2
R912
470
TR902
2SC458C
D908
HZ5B
1S2075K×3
⑥(From R501) UNBLANKING
③(From R258) CHOP BLANK
D901
D903
D902
C912
10μ/25
TR903
2SD66
R905
680
R907
2.2K
TR901
2SC458
C905
47P
R904
68K
-12V
C907
10μ/25V
J901
④
R901
47K
EXT BLANKING
R902
10K
R903
10K
-12V
C903
0.01
+12V
P905
1
2
3
J905
RV1101
10K
INTEN (FRONT PANEL



FOR V-151B, V152B

⑧ Z AXIS AMPLIFIER


+12V
+12V
C1203
100
RV1203
5K
R1203
15K
C1204
1000P
R1204
750
J1201
0.5Vp-p
J402
GND
R1201
39K
R1202
47K
IC1201
CD 4011UBE
C1202
0.01
PEF472
FRONT PANEL
+12
IC

ELECTRICAL REPLACEABLE PARTS LIST

CIRCUIT BOAD(PEF-467)

Symbol	Description	Code	Q'ty		
			151B	152B	302B
CV1	C,VARIABLE ECV-1ZW10×60	CVE0025		1	1
C2	C,CERAMIC 50 V 100 PF+-10%	CCC1025		1	1
CV2	C,VARIABLE ECV-1ZW10×60	CVE0025		1	1
CV3	C,VARIABLE ECV-1ZW10×60	CVE0025		1	1
C4	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002		1	1
CV4	C,VARIABLE ECV-1ZW10×60	CVE0025		1	1
C5	C,MICA 300 V 680 PF+-5%	CMD0359		1	1
C8	C,CERAMIC 500 V10000 PF+-10%	CCD0218		1	1
C9	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029		1	1
C13	C,PLASTIC 50 V10000 PF+-10%	CQA0097		1	1
C16	C,CERAMIC 50 V 3 PF+-0.25%	CCC0997		1	1
C20	C,CERAMIC 50 V 39 PF+-5%	CCC1013			1
C21	C,AL ELYC 25 V 10 UF	CEC0175		1	1
C22	C,AL ELYC 25 V 10 UF	CEC0175		1	1
C23	C,CERAMIC 50 V 100 PF+-10%	CCC1025		1	1
C25	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029		1	1
C26	C,AL ELYC 25 V 10 UF	CEC0175		1	1
C30	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002			1
CV42	C,VARIABLE ECV-1ZW40×60	CVE0027			1
C47	C,CERAMIC 50 V 33 PF+-5%	CCC1011			1
C55	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029		1	1
C66	C,AL ELYC 25 V 10 UF	CEC0175		1	1
C67	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C73	C,PLASTIC 50 V 1000 PF+-10%	CQA0091		1	1
CV101	C,VARIABLE ECV-1ZW10×60	CVE0025	1	1	1
C102	C,CERAMIC 50 V 100 PF+-10%	CCC1025	1	1	1
CV102	C,VARIABLE ECV-1ZW10×60	CVE0025	1	1	1
CV103	C,VARIABLE ECV-1ZW10×60	CVE0025	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
C104	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002	1	1	1
CV104	C,VARIABLE ECV-1Z10×60	CVE0025	1	1	1
C105	C,MICA 300 V 680 PF+-5%	CMD0359	1	1	1
C108	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1	1
C109	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1	1
C113	C,PLASTIC 50 V10000 PF+-10%	CQA0097	1	1	1
C116	C,CERAMIC 50 V 3 PF+-0.25PF	CCC0997	1	1	1
C120	C,CERAMIC 50 V 33 PF+-5%	CCC1011			1
C121	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C122	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C123	C,CERAMIC 50 V 100 PF+-10%	CCC1025	1	1	1
C125	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1	1
C126	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C130	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002			1
CV142	C,VARIABLE ECV-1ZW40×60	CVE0027			1
C147	C,CERAMIC 50 V 33 PF+-5%	CCC1011			1
C154	C,CERAMIC 50 V 5 PF+-0.25PF	CCC0999	1	1	1
C161	C.CERAMIC 50 V 1000 PF+80%-20%	CCC1029		1	1
C162	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1	1
C173	C,PLASTIC 50 V 1000 PF+-10%	CQA0091	1	1	1
C201	C,CERAMIC 50 V 15 PF+-5%	CCCI004			1
C211	C,CERAMIC 50 V 15 PF+-5%	CCC1004			1
C309	C,CERAMIC 50 V 220 PF+-10%	CCC1027	1	1	
C309	C,PLASTIC 50 V10000 PF+-10%	CQA0097			1
C310	C,CERAMIC 50 V 22 PF+-5%	CCC1007			1
C310	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002	1	1	
CV316	C,VARIABLE ECV-1ZW20×60	CVE0026	1	1	1
C1001	C,AL ELYC 25 V 100 UF	CEC0177	1	1	1
C1002	C,PLASTIC 50 V 0.33 UF+-10%	CQA0018	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
C1005	C,PLASTIC 50 V47000 PF+-10%	CQA0101	1	1	1
C1011	C,CERAMIC 2000 V 2200 PF+-10%	CCD0219	1	1	1
C1012	C,CERAMIC 2000 V 4700 PF+-10%	CCD0221	1	1	1
C1013	C,CERAMIC 2000 V 4700 PF+-10%	CCD0221	1	1	1
C1011A	C,CERAMIC 2000 V 2200 PF+-10%	CCD0219			1
C1012A	C,CERAMIC 2000 V 2200 PF+-10%	CCD0219			1
C1013A	C,CERAMIC 2000 V 2200 PF+-10%	CCD0219			1
C1014A	C,CERAMIC 2000 V 2200 PF+-10%	CCD0219			1
C1016	C,CERAMIC 2000 V 1000 PF+-10%	CCD0220	1	1	1
C1020	C,CERAMIC 500 V 1000 PF+-10%	CCD0217	1	1	1
C1021	C,AL ELYC 160 V 1 UF	CEC0213	1	1	1
C1023	C,CERAMIC 2000 V 2200 PF+-10%	CCD0219	1	1	1
C1025	C,CERAMIC 2000 V 4700 PF+-10%	CCD0221	1	1	1
C1101	C,AL ELYC 350 V 47 UF	CEC0142	1	1	
C1101	C,AL ELYC 250 V 100 UF	CEC0433			1
C1111	C,AL ELYC 25 V 2200 UF	CEC0347	1	1	1
C1112	C,AL ELYC 25 V 100 UF	CEC0177	1	1	1
C1121	C,AL ELYC 25 V 1000 UF	CEC0178	1	1	1
C1122	C,AL ELYC 25 V 100 UF	CEC0177	1	1	1
C1131	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	1	1
C1132	C,AL ELYC 25 V 100 UF	CEC0177	1	1	1
D201	DIODE 1S2075 T-D	HDS0108		1	1
D202	DIODE 1S2075 T-D	HDS0108		1	1
D203	DIODE 1S2075 T-D	HDS0108		1	1
D204	DIODE 1S2075 T-D	HDS0108		1	1
D211	DIODE 1S2075 T-D	HDS0108		1	1
D212	DIODE 1S2075 T-D	HDS0108		1	1
D213	DIODE 1S2075 T-D	HDS0108	1	1	1
D214	DIODE 1S2075 T-D	HDS0108	1	1	1
D1011	DIODE Y10GA	HDY0031	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
D1012	DIODE Y10GA	HDY0031	1	1	1
D1011A	DIODE Y10GA	HDY0031			1
D1012A	DIODE Y10GA	HDY0031			1
D1013A	DIODE Y10GA	HDY0031			1
D1014A	DIODE Y10GA	HDY0031			1
D1021	DIODE 1SS83	HDS0250	1	1	1
D1022	DIODE 1SS83	HDS0250	1	1	1
D1023	DIODE Y10GA	HDY0031	1	1	1
D1024	DIODE Y10GA	HDY0031	1	1	1
D1101	DIODE M4G-1	HDM0034	1	1	1
D1111	DIODE M4C-1	HDM0033	1	1	1
F1001	FUSE FR-11 125V DIA6.3×8.7 0.5A	EFL0012	1	1	1
IC1	ANALOG IC HA17741PS	ILH0088		1	1
IC101	ANALOG IC HA17741PS	ILH0088	1	1	1
IC201	IC HD74LS74AP	IDH0586	1	1	1
IC1111	DIGITAL IC UA7812UC	IDM0318	1	1	1
IC1121	DIGITAL IC UA7912UC	IDM0319	1	1	1
IC1131	DIGITAL IC UA7805UC	IDM0320	1	1	1
L4	COIL FL-3H 1ROM	TLF0054			1
NL1024	LAMP NE-2	ELL0019	1	1	1
NL1025	LAMP NE-2	ELL0019	1	1	1
P2	CONNECTOR 171825-3	JBX0468		1	1
P102	CONNECTOR 171825-3	JBX0468	1	1	1
P201	CONNECTOR 171825-3	JBX0468		1	1
P202	CONNECTOR 171825-3	JBX0468		1	1
P203	CONNECTOR 171825-3	JBX0468	1	1	1
PEF-467C	PCB PEF-467B	HX116412	1	1	1
P1001	CONNECTOR 171825-3	JBX0468	1	1	1
P1002	CONNECTOR 171825-6	JBX0470	1	1	1
P1102	CONNECTOR 171825-8	JBX0467	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
P1103	CONNECTOR 171825-8	JBX0467	1	1	1
P1104	CONNECTOR 163685-4	JBX0469	1	1	1
R1	R,METAL 1/2W 909 KOHM+-1%	RMR3246		1	1
R2	R,METAL 1/4W 113 KOHM+-1%	RME0740		1	1
R3	R,METAL 1/2W 990 KOHM+-1%	RMR0082		1	1
R4	R,CARBON 1/4W 100 OHM+-5%	RCR3028		1	
R4	R,CARBON 1/4W 820 OHM+-5%	RCR3050			1
R5	R,METAL 1/4W 10.0 KOHM+-1%	RME0676		1	1
R6	R,METAL 1/2W 1 MOHM+-1%	RMR0204		1	1
R7	R,CARBON 1/4W 220 KOHM+-5%	RCR3102		1	1
R8	R,CARBON 1/4W 220 OHM+-5%	RCR3036		1	1
R9	R,METAL 1/4W 475 OHM+-1%	RME0660		1	1
R10	R,METAL 1/4W 412 OHM+-1%	RME0733		1	1
RV11	VR,METAL 3339W-1-201	RNX0258		1	1
R12	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068		1	1
R13	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056		1	1
R14	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064		1	1
R15	R,CARBON 1/4W 150 OHM+-5%	RCR3032		1	1
R16	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1	1
RV16	VR,CARBON EVL-S0AA00B52	RDE0010		1	1
		HX8311711		R	R
		HX8311704		R	R
R17	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064		1	1
R18	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1	1
RV18	VR,CARBON EVL-S0AA00B22	RDE0012		1	1
		HX8311711		R	R
		HX8311704		R	R
R19	R,CARBON 1/4W 560 OHM+-5%	RCR3046		1	1
R20	R,CARBON 1/4W 22 OHM+-5%	RCR3012			1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R21	R,CARBON 1/4W 22 OHM+-5%	RCR3012		1	1
R22	R,CARBON 1/4W 22 OHM+-5%	RCR3012		1	1
R23	R,CARBON 1/4W 22 KOHM+-5%	RCR3084		1	1
R24	R,METAL 1/4W 6.19 KOHM+-1%	RME0729		1	1
R25	R,CARBON 1/4W 470 OHM+-5%	RCR3044		1	1
R26	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056		1	1
R27	R,METAL 1/4W 71.5 KOHM+-1%	RME0734		1	1
R28	R,METAL 1/4W 10.7 KOHM+-1%	RME0735		1	1
R29	R,CARBON 1/4W 680 OHM+-5%	RCR3048		1	1
RV29	VR,CARBON V16L4-N20KC B 1 KOHM	HX3142131-A		1	1
R30	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052		1	1
R31	R,METAL 1/4W 240 OHM+-1%	RME0736		1	1
R32	R,METAL 1/4W 120 OHM+-1%	RME0726		1	1
R33	R,METAL 1/4W 71.5 OHM+-1%	RME0737		1	1
R34	R,METAL 1/4W 47.5 OHM+-1%	RME0648		1	1
R35	R,CARBON 1/4W 120 OHM+-1%	RCR3030		1	1
R36	R,CARBON 1/4W 33 OHM+-5%	RCR3016		1	1
R37	R,CARBON 1/4W 75 OHM+-5%	RCR3025		1	1
R38	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1	1
R40	R,CARBON 1/4W 10 KOHM+-5%	RCR3076		1	1
R41	R,CARBON 1/4W 150 OHM+-%	RCR3032		1	
R41	R,CARBON 1/4W 270 OHM+-5%	RCR3038			1
R42	R,CARBON 1/4W 22 OHM+-5%	RCR3012			1
R43	R,CARBON 1/4W 68 OHM+-5%	RCR3024			1
R43	R,CARBON 1/4W 82 OHM+-5%	RCR3026		1	
RV43	VR,CARBON EVL-SOAA00B22	RDE0012		1	1
		HX8311711		R	R
		HX8311704		R	R
R44	R,CARBON 1/4W 2.7 KOHM+-5%	RCR3062		1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
RV44	VR,CARBON EVL-S0AA00B23	RDE0015		1	1
		HX8311711		R	R
		HX8311704		R	R
R45	R,CARBON 1/4W 2.7 KOHM+-5%	RCR3062		1	1
R47	R,CARBON 1/4W 330 OHM+-5%	RCR3040		1	1
R48	R,CARBON 1/4W 330 OHM+-5%	RCR3040		1	1
R49	R,CARBON 1/4W 100 OHM+-5%	RCR3028		1	1
R50	R,CARBON 1/4W 100 OHM+-5%	RCR3028		1	1
R51	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1	1
RV51	VR,CARBON EVH-Y13K20B13	RDE0013		1	1
		HX8311705		R	R
		HX8311701		R	R
R52	R,METAL 1/4W 1.15 KOHM+-1%	RME0727		1	1
R53	R,METAL 1/4W 1.15 KOHM+-1%	RME0727		1	1
R54	R,CARBON 1/4W 470 OHM+-5%	RCR3044		1	1
R55	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1	1
R72	R,CARBON 1/4W 39 OHM+-5%	RCR3018		1	1
R73	R,CARBON 1/4W 6.8 OHM+-5%	RCR3003		1	1
R101	R,METAL 1/2W 909 KOHM+-1%	RMR3246	1	1	1
R102	R,METAL 1/4W 113 KOHM+-1%	RME0740	1	1	1
R103	R,METAL 1/2W 990 KOHM+-1%	RMR0082	1	1	1
R104	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R105	R,METAL 1/4W 10.0 KOHM+-1%	RME0676	1	1	1
R106	R,METAL 1/2W 1 MOHM+-1%	RMR0204	1	1	1
R107	R,CARBON 1/4W 220 KOHM+-5%	RCR3102	1	1	1
R108	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1	1
R109	R,METAL 1/4W 475 OHM+-1%	RME0660	1	1	1
R110	R,METAL 1/4W 412 OHM+-1%	RME0733	1	1	1
RV111	VR,METAL 3339W-1-201	RNX0258	1	1	1
R112	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R113	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	1	1
R114	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R115	R,CARBON 1/4W 150 OHM+-5%	RCR3032	1	1	1
R116	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
RV116	VR,CARBON EVL-S0AA00B52	RDE0010	1	1	1
		HX8311711	R	R	R
		HX8311704	R	R	R
R117	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R118	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
RV118	VR,CARBON EVL-S0AA00B22	RDE0012	1	1	1
		HX8311711	R	R	R
		HX8311704	R	R	R
R119	R,CARBON 1/4W 560 OHM+-5%	RCR3046	1	1	1
R120	R,CARBON 1/4W 22 OHM+-5%	RCR3012			1
R121	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	1	1
R122	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	1	1
R123	R,CARBON 1/4W 22 KOHM+-5%	RCR3084	1	1	1
R124	R,METAL 1/4W 6.19 KOHM+-1%	RME0729	1	1	1
R125	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	1
R126	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	1	1
R127	R,METAL 1/4W 71.5 KOHM+-1%	RME0734	1	1	1
R128	R,METAL 1/4W 10.7 KOHM+-1%	RME0735	1	1	1
R129	R,CARBON 1/4W 680 OHM+-5%	RCR3048	1	1	1
RV129	VR,CARBON V16L4-N20KC B1KOHM	HX3142131-A	1	1	1
R130	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1	1
R131	R,METAL 1/4W 240 OHM+-1%	RME0736	1	1	1
R132	R,METAL 1/4W 120 OHM+-1%	RME0726	1	1	1
R133	R,METAL 1/4W 71.5 OHM+-1%	RME0737	1	1	1
R134	R,METAL 1/4W 47.5 OHM+-1%	RME0648	1	1	1
R135	R,CARBON 1/4W 120 OHM+-5%	RCR3030	1	1	1
R136	R,CARBON 1/4W 33 OHM+-5%	RCR3016	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R137	R,CARBON 1/4W 75 OHM+-5%	RCR3025	1	1	1
R138	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1	1
R140	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1	1
R141	R,CARBON 1/4W 150 OHM+-5%	RCR3032	1	1	
R141	R,CARBON 1/4W 270 OHM+-5%	RCR3038			1
R142	R,CARBON 1/4W 22 OHM+-5%	RCR3012			1
R143	R,CARBON 1/4W 68 OHM+-5%	RCR3024			1
R143	R,CARBON 1/4W 82 OHM+-5%	RCR3026	1	1	
RV143	VR,CARBON EVL-SOAA00B22	RDE0012	1	1	1
		HX8311711	R	R	R
		HX8311704	R	R	R
R144	R,CARBON 1/4W 2.7 KOHM+-5%	RCR3062	1	1	1
RV144	VR,CARBON EVL-SOAA00B23	RDE0015	1	1	1
		HX8311711	R	R	R
		HX8311704	R	R	R
R145	R,CARBON 1/4W 2.7 KOHM+-5%	RCR3062	1	1	1
R147	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1	1
R148	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1	1
R149	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R150	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R151	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
RV151	VR,CARBON EVH-Y13K20B13	RDE0013	1	1	1
		HX8311705	R	R	R
		HX8311701	R	R	R
R152	R,METAL 1/4W 1.15 KOHM+-1%	RME0727	1	1	1
R153	R,METAL 1/4W 1.15 KOHM+-1%	RME0727	1	1	1
R154	R,CARBON 1/4W 33 OHM+-5%	RCR3016	1	1	1
R161	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1	1
R162	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R163	R,CARBON 1/4W 470 OHM+-5%	RCR3044		1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R164	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	1
R172	R,CARBON 1/4W 39 OHM+-5%	RCR3018	1	1	1
R173	R,CARBON 1/4W 6.8 OHM+-5%	RCR3003	1	1	1
R201	R,CARBON 1/4W 330 OHM+-5%	RCR3040		1	1
R202	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061		1	1
R203	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061		1	1
R204	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1	1
R205	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052		1	1
R206	R,CARBON 1/4W 680 OHM+-5%	RCR3048		1	1
R207	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1	1
R208	R,CARBON 1/4W 100 OHM+-5%	RCR3028		1	1
R209	R,CARBON 1/4W 220 OHM+-5%	RCR3036		1	1
R211	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1	1
R212	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061	1	1	1
R213	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061	1	1	1
R214	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R215	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1	1
R216	R,CARBON 1/4W 680 OHM+-5%	RCR3048	1	1	1
R217	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1	1
R218	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R219	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1	1
R221	R,CARBON 1/4W 150 OHM+-5%	RCR3032		1	1
R222	R,CARBON 1/4W 150 OHM+-5%	RCR3032		1	1
R223	R,CARBON 1/4W 150 OHM+-5%	RCR3032	1	1	1
R224	R,CARBON 1/4W 150 OHM+-5%	RCR3032	1	1	1
R265	R,CARBON 1/4W 470 OHM+-5%	RCR3044		1	1
R301	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1	1
R302	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	1
R303	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064		1	1
R304	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064		1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R305	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R306	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R307	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1	1
R308	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	1
R309	R,CARBON 1/4W 39 KOHM+-5%	RCR3090	1	1	
R309	R,CARBON 1/4W 68 KOHM+-5%	RCR3096			1
R310	R,CARBON 1/4W 27 KOHM+-5%	RCR3086			1
R310	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1	
R311	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	1	1
R312	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	1	1
R313	R,CARBON 1/4W 91 OHM+-5%	RCR3027	1	1	1
R314	R,CARBON 1/4W 91 OHM+-5%	RCR3027	1	1	1
R315	R,CARBON 1/2W 560 OHM+-5%	RCR3153	1	1	1
R316	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	
R316	R,CARBON 1/4W 680 OHM+-5%	RCR3048			1
R1001	R,METAL 1/4W 82.5 KOHM+-1%	RME0687	1	1	
R1001	R,METAL 1/4W 100 KOHM+-1%	RME0688			1
RV1001	VR,CARBON EVL-SOAA00B54 50K OHM	RDE0017	1	1	1
		HX8311711	R	R	R
		HX8311704	R	R	R
R1002	R,CARBON 1/4W 220 KOHM+-5%	RCR3102	1	1	1
R1003	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1	1
R1004	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R1006	R,CARBON 1/4W 33 OHM+-5%	RCR3016	1	1	1
R1011	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1	1
R1016	R,CARBON 1/2W 1.8 MOHM+-5%	RCR3476	1	1	
R1017	R,CARBON 2 W 12 MOHM+-5%	RCR4171	1	1	
R1017	R,CARBON 2 W 9.1 MOHM+-5%	RCR4172			1
R1016	R,CARBON 1/2W 2.7 MOHM+-5%	RCR3480			1
R1020	R,CARBON 1/4W 390 KOHM+-5%	RCR3426	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R1021	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1	1
RV1021	VR,CARBON EVT-S0AA00B54	RDE0018	1	1	1
		HX8311713	R	R	R
		HX8311704	R	R	R
R1022	R,CARBON 1/4W 33 KOHM+-5%	RCR3088	1	1	
R1022	R,CARBON 1/4W 22 KOHM+-5%	RCR3084			1
R1024	R,SOLID 1/2W 22 MOHM+-5%	RSR0420	1	1	1
R1026	R,CARBON 1/4W 270 OHM+-5%	RCR3038	1	1	1
R1102	R,METAL 5 W 820 OHM+-5%	RMR3229	1	1	
R1102	R,CARBON 1/4W 22 OHM+-5%	RCR3012			1
R1111	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1	1
R1131	R,METAL 5 W 47 OHM+-5%	RMR2837	1	1	1
R1141	R,CARBON 1/4W 470 KOHM+-5%	RCR3104	1	1	1
R1142	R,CARBON 1/4W 33 KOHM+-5%	RCR3088	1	1	1
R1143	R,CARBON 1/4W 100 KOHM+-5%	RCR3100	1	1	1
S2	SW,ROTARY S21P2310	HX8311685		1	1
		HX8311686		R	R
S102	SW,ROTARY S21P2310	HX8311685	1	1	1
		HX8311686	R	R	R
S201	SW,LEVER SLA245	SSL0053		1	1
TR1	TRANSISTOR 2SK30AY	HTK0011		1	1
TR2	TRANSISTOR E412S-A	HTE0004		1	1
TR3	TRANSISTOR 2SC1674K	HTC0557		1	1
TR4	TRANSISTOR 2SC1674K	HTC0557		1	1
TR5	TRANSISTOR 2SC458C	HTC0148		1	1
TR6	TRANSISTOR 2SC1906	HTC0338		1	1
TR7	TRANSISTOR 2SC1906	HTC0338		1	1
TR8	TRANSISTOR 2SA836D	HTA0105		1	1
TR9	TRANSISTOR 2SA836D	HTA0105		1	1
TR3	CORE L1-RH0303	HX841221		1	1

Symbol	Description		Code	Q'ty		
				151B	152B	302B
TR4	CORE	L1-RH0303	HX841221		1	1
TR101	TRANSISTOR	2SK30AY	H1K0011	1	1	1
TR102	TRANSISTOR	E412S-A	HTE0004	1	1	1
TR103	TRANSISTOR	2SC1674K	HTC0557	1	1	1
TR104	TRANSISTOR	2SC1674K	HTC0557	1	1	1
TR105	TRANSISTOR	2SC458C	HTC0148	1	1	1
TR106	TRANSISTOR	2SC1906	HTC0338	1	1	1
TR107	TRANSISTOR	2SC1906	HTC0338	1	1	1
TR103	CORE	L1-RH0303	HX841221	1	1	1
TR104	CORE	L1-RH0303	HX841221	1	1	1
TR111	TRANSISTOR	2SA836D	HTA0105		1	1
TR112	TRANSISTOR	2SA836D	HTA0105		1	1
TR113	TRANSISTOR	2SA836D	HTA0105	1	1	1
TR114	TRANSISTOR	2SA836D	HTA0105	1	1	1
TR201	TRANSISTOR	2SA781K	HTA0099			1
TR202	TRANSISTOE	2SA781K	HTA0099			1
TR203	TRANSISTOR	2SC458C	HTC0148		1	1
TR201	TRANSISTOR	2SA836D	HTA0105		1	
TR202	TRANSISTOR	2SA836D	HTA0105		1	
TR211	TRANSISTOR	2SA781K	HTA0099			1
TR212	TRANSISTOR	2SA781K	HTA0099			1
TR213	TRANSISTOR	2SC458C	HTC0148	1	1	1
TR211	TRANSISTOR	2SA836D	HTA0105	1	1	
TR212	TRANSISTOR	2SA836D	HTA0105	1	1	
TR301	TRANSISTOR	2SC1906	HTC0338	1	1	1
TR302	TRANSISTOR	2SC1906	HTC0338	1	1	1
T1001	XFMR		HX8311682	1	1	1
TR1001	TRANSISTOR	2SC1707HC	HTC0322	1	1	1
TR1002	TRANSISTOR	2SA836D	HTA0105	1	1	1
TR1003	TRANSISTOR	2SC1061C	HTC0032	1	1	1

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(PEF-468)

Symbol	Description	Code	Q'ty		
			151B	152B	302B
C251	C,CERAMIC 50 V 220 PF+-10%	CCC1027		1	1
C252	C,PLASTIC 50 V 1000 PF+-10%	CQA0091		1	1
C253	C,AL ELYC 25 V 10 UF	CEC0175		1	1
C256	C,CERAMIC 50 V 220 PF+-10%	CCC1027		1	1
C261	C,CERAMIC 50 V 220 PF+-10%	CCC1027			1
C261	C,CERAMIC 50 V 470 PF+-10%	CCC0872		1	
C400	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	1	1
C403	C,CERAMIC 500 V 15 PF+-10%	CCC0774	1	1	1
C404	C,PLASTIC 600 V22000 PF+-10%	CQX0071	1	1	1
C405	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	1	1
C407	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1	1
C412	C,AL ELYC 50 V 1 UF NP	CEC0391	1	1	1
C413	C,AL ELYC 25 V 100 UF	CEC0177	1	1	1
C415	C,PLASTIC 50 V10000 PF+-10%	CQA0097	1	1	1
C416	C,CERAMIC 50 V 22 PF+-5%	CCC1007	1	1	1
C427	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C441	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C504	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	1	1
C505	C,CERAMIC 50 V 33 PF+-5%	CCC1011	1	1	1
C510	C,CERAMIC 50 V 82 PF+-5%	CCC1032	1	1	1
CV510	C,VARIABLE ECV-1ZW40×60	CVE0027	1	1	1
C511	C,PLASTIC 100 V 1 UF+-1%	CQT0051	1	1	1
C512	C,PLASTIC 100 V 0.01UF+-1%	CQT0052	1	1	1
C524	C,PLASTIC 50 V 1000 PF+-10%	CQA0091	1	1	1
C525	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C526	C,PLASTIC 50 V 0.1 UF+-10%	CQA0103	1	1	1
C541	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C542	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C801	C,CERAMIC 50 V 39 PF+-5%	CCC1013	1	1	1
C807	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
C814	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	1	1
C817	C,PLASTIC 50 V 1000 PF+-10%	CQA0091	1	1	1
C823	C,CERAMIC 500 V 1 PF+-0.25PF	CCC1353	1	1	1
C824	C,CERAMIC 500 V 1 PF+-0.25PF	CCC1353	1	1	1
C903	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	1	1
C905	C,CERAMIC 50 V 47 PF+-5%	CCC1014	1	1	1
C906	C,CERAMIC 500 V 1 PF+-0.25PF	CCC1353	1	1	1
C907	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C911	C,AL ELYC 250 V 4.7 UF	CEC0219	1	1	1
C912	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C920	C,AL ELYC 25 V 10 UF	CEC0175			1
D251	DIODE 1S2075 T-D	HDS0108		1	1
D252	DIODE 1S2075 T-D	HDS0108		1	1
D413	DIODE 1S2075 T-D	HDS0108	1	1	1
D431	DIODE 1S2075 T-D	HDS0108	1	1	1
D501	DIODE 1S2075 T-D	HDS0108	1	1	1
D502	DIODE 1S2075 T-D	HDS0108	1	1	1
D503	DIODE 1S2075 T-D	HDS0108	1	1	1
D504	DIODE MA161	HDM0051	1	1	1
D505	DIODE 1S2075 T-D	HDS0108	1	1	1
D506	DIODE 1S2075 T-D	HDS0108	1	1	1
D801	DIODE 1S2075 T-D	HDS0108		1	1
D802	DIODE 1S2075 T-D	HDS0108	1	1	1
D803	DIODE 1S2075 T-D	HDS0108	1	1	1
D901	DIODE 1S2075 T-D	HDS0108	1	1	1
D902	DIODE 1S2075 T-D	HDS0108		1	1
D903	DIODE 1S2075 T-D	HDS0108	1	1	1
D908	DIODE HZ5B T-D	HDH0029	1	1	1
IC251	DIGITAL IC HD74LS02P	IDH0646		1	1
IC252	DIGITAL IC HD7402P	IDH0179		1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
IC401	DIGITAL IC HD7400P	IDH0177	1	1	
IC401	DIGITAL IC HD74S00	IDH0402			1
IC501	IC HD74LS74AP	IDH0586	1	1	
IC501	DIGITAL IC HD74S74	IDH0428			1
IC502	DIGITAL IC HD74123P	IDH0323	1	1	1
L261	COIL FL-5H 101K	TLF0067		1	1
L827	COIL FL-7H 222J	TLF0021			1
L827	COIL FL-7H 682J	TLF0148	1	1	
P251	CONNECTOR 171825-3	JBX0468		1	1
P405	CONNECTOR 171825-3	JBX0468		1	1
P406	CONNECTOR 171825-3	JBX0468	1	1	1
PEF-468C	PCB PEF-468B~474B	HX116413	1	1	1
		HX283858	R	R	R
		HX8311790	R	R	R
P801	CONNECTOR 171825-5	JBX0454	1	1	1
P902	CONNECTOR 171825-8	JBX0467	1	1	1
P905	CONNECTOR 171825-3	JBX0468	1	1	1
R251	R,CARBON 1/4W 270 OHM+-5%	RCR3038		1	1
R252	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1	1
R256	R,CARBON 1/4W 680 OHM+-5%	RCR3048		1	1
R257	R,CARBON 1/4W 27 KOHM+-5%	RCR3086		1	
R257	R,CARBON 1/4W 15 KOHM+-5%	RCR3080			1
R258	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056		1	1
R261	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052		1	1
R262	R,CARBON 1/4W 27 KOHM+-5%	RCR3086		1	1
R401	R,CARBON 1/4W 18 KOHM+-5%	RCR3082	1	1	1
R402	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1	1
R403	R,CARBON 1/4W 470 KOHM+-5%	RCR3104	1	1	1
R404	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R405	R,CARBON 1/4W 470 KOHM+-5%	RCR3104	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R406	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1	1
R407	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1	1
R408	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R409	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1	1
R410	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	1
R411	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R412	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1	1
R413	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R414	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1	1
R415	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1	1
R416	R,CARBON 1/4W 27 KOHM+-5%	RCR3086	1	1	1
R417	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R421	R,CARBON 1/4W 1.8 KOHM+-5%	RCR3058	1	1	1
R422	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R423	R,CARBON 1/4W 1.8 KOHM+-5%	RCR3058	1	1	1
R424	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R425	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R426	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R427	R,CARBON 1/4W 33 KOHM+-5%	RCR3088	1	1	1
R431	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1	1
RV401	VR,CARBON EVH-Y13K20B14	RDE0003	1	1	1
		HX8311705	R	R	R
		HX8311701	R	R	R
R501	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1	1
R502	R,CARBON 1/4W 470 OHM+-5%	RCR3044		1	1
R503	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	1	1
R504	R,CARBON 1/4W 22 KOHM+-5%	RCR3084	1	1	1
RV504	VR,CARBON EVL-SOAA00B53	RDE0004	1	1	1
		HX8311711	R	R	R
		HX8311704	R	R	R

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R511	R,METAL 1/2W 1.4 MOHM+-1%	RMR3070	1	1	1
R512	R,METAL 1/2W 698 KOHM+-1%	RMR3249	1	1	1
R513	R,METAL 1/4W 422 KOHM+-1%	RME0738	1	1	1
R514	R,METAL 1/4W 140 KOHM+-1%	RME0732	1	1	1
R515	R,METAL 1/4W 69.8 KOHM+-1%	RME0739	1	1	1
R516	R,METAL 1/4W 27.4 KOHM+-1%	RME0728	1	1	1
R517	R,METAL 1/8W 69.8 KOHM+-1%	RMR3251	1	1	1
R521	R,METAL 2 W 22 KOHM+-5%	RMR2807	1	1	
R521	R,METAL 2 W 15 KOHM+-5%	RMR2806			1
R522	R,CARBON 1/4W 12 KOHM+-5%	RCR3078	1	1	1
R523	R,CARBON 1/4W 15 KOHM+-5%	RCR3080	1	1	1
R524	R,CARBON 1/4W 15 KOHM+-5%	RCR3080	1	1	1
R525	R,CARBON 1/4W 22 KOHM+-5%	RCR3084	1	1	1
R801	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1	1
R802	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1	1
R803	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068		1	1
R804	R,CARBON 1/4W 1.2 KOHM+-5%	RCR3054		1	1
RV804	VR,CARBON EVL-SOAA00B23	RDE0015		1	1
		HX8311711		R	R
		HX8311704		R	R
R805	R,CARBON 1/4W 6.8 KOHM+-5%	RCR3072		1	1
R806	R,CARBON 1/4W 3.9 KOHM+-5%	RCR3066	1	1	1
RV806	VR,CARBON EVL-SOAA00B53	RDE0004	1	1	1
R807	R,CARBON 1/4W 3.9 KOHM+-5%	RCR3066		1	1
R808	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1	1
R809	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	1	1
R810	R,METAL 1/4W 158 KOHM+-1%	RME0731	1	1	
R810	R,METAL 1/4W 127 KOHM+-1%	RME0730			1
R811	R,METAL 1/4W 127 KOHM+-1%	RME0730			1
R811	R,METAL 1/4W 158 KOHM+-1%	RME0731	1	1	

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R812	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056			1
R812	R,CARBON 1/4W 1.2 KOHM+-5%	RCR3054	1	1	
RV812	VR,CARBON EVL-SOAA00B13	RDE0014	1	1	1
		HX8311711	R	R	R
		HX8311704	R	R	R
R813	R,CARBON 1/4W 8.2 KOHM+-5%	RCR3074	1	1	1
R814	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R815	R,CARBON 1/4W 12 KOHM+-5%	RCR3078	1	1	1
R816	R,CARBON 1/4W 68 OHM+-5%	RCR3024	1	1	1
RV816	VR,CARBON EVL-SOAA00B22	RDE0012	1	1	1
		HX8311711	R	R	R
		HX8311704	R	R	R
R821	R,METAL 1/4W 6.19 KOHM+-1%	RME0729	1	1	1
R822	R,METAL 1/4W 6.19 KOHM+-1%	RME0729	1	1	1
R823	R,CARBON 1/2W 100 KOHM+-5%	RCR3207	1	1	
R823	R,CARBON 1/2W 68 KOHM+-5%	RCR3203			1
R824	R,CARBON 1/2W 100 KOHM+-5%	RCR3207	1	1	
R824	R,CARBON 1/2W 68 KOHM+-5%	RCR3203			1
R825	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R826	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1	1
R827	R,METAL 5 W 22 KOHM+-5%	RMR2853	1	1	
R827	R,METAL 5 W 10 KOHM+-5%	RMR2851			1
R828	R,METAL 5 W 10 KOHM+-5%	RMR2851			1
R828	R,METAL 5 W 22 KOHM+-5%	RMR2853	1	1	
R829	R,CARBON 1/4W 270 OHM+-5%	RCR3038	1	1	1
R830	R,CARBON 1/4W 270 OHM+-5%	RCR3038	1	1	1
R901	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1	1
R902	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1	1
R903	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1	1
R904	R,CARBON 1/4W 68 KOHM+-5%	RCR3096	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R905	R,CARBON 1/4W 680 OHM+-5%	RCR3048	1	1	1
R906	R,CARBON 1/2W 47 KOHM+-5%	RCR3199	1	1	1
R907	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R908	R,METAL 2 W 22 KOHM+-5%	RMR2807	1	1	
R908	R,METAL 2 W 10 KOHM+-5%	RMR2805			1
R909	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1	
R909	R,CARBON 1/4W 820 OHM+-5%	RCR3050			1
R910	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	1
R911	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R912	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	1
R913	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
S402	SW,LEVER SLA224 NON SHORT	SSL0054	1	1	1
S403	SW,LEVER SLA244 NON SHORT	SSL0055	1	1	1
S501	SW,ROTARY S21P3520	HX8311684	1	1	1
		HX8311686	R	R	R
TR401	TRANSISTOR 2SK106C	HTK0068	1	1	1
TR402	TRANSISTOR 2SC458C	HTC0148	1	1	1
TR403	TRANSISTOR 2SA836D	HTA0105	1	1	1
TR404	TRANSISTOR 2SA836D	HTA0105	1	1	1
TR406	TRANSISTOR 2SC1906	HTC0338	1	1	1
TR407	TRANSISTOR 2SC1906	HTC0338	1	1	1
TR501	TRANSISTOR 2SK30AY	HTK0011	1	1	1
TR502	TRANSISTOR 2SC458C	HTC0148	1	1	1
TR503	TRANSISTOR 2SC458C	HTC0148	1	1	1
TR801	TRANSISTOR 2SC458C	HTC0148		1	1
TR802	TRANSISTOR 2SA836D	HTA0105	1	1	1
TR803	TRANSISTOR 2SA836D	HTA0105	1	1	1
TR804	TRANSISTOR 2SA836D	HTA0105	1	1	1
TR805	TRANSISTOR 2SA836D	HTA0105	1	1	1
TR806	TRANSISTOR 2SA836D	HTA0105	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
TR807	TRANSISTOR 2SC1722	HTC0514	1	1	1
TR808	TRANSISTOR 2SC1722	HTC0514	1	1	1
TR901	TRANSISTOR 2SC458C	HTC0148	1	1	1
TR902	TRANSISTOR 2SC458C	HTC0148	1	1	1
TR903	TRANSISTOR 2SD668A-C	HTD0100	1	1	1
TR904	TRANSISTOR 2SC1722	HTC0514	1	1	1

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(PEF-469)

Symbol	Description	Code	Q'ty		
			151B	152B	302B
C320	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C323	C,CERAMIC 50 V 68 PF+-5%	CCC1034	1	1	
CV323	C,VARIABLE ECV-1ZW40×60	CVE0027			1
C325	C,CERAMIC 50 V 39 PF+-5%	CCC1013			1
C326	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	1	1
C327	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
CV330	C,VARIABLE ECV-1ZW40×60	CVE0027	1	1	1
C331	C,CERAMIC 50 V 15 PF+-5%	CCC1004			1
C331	C,CERAMIC 50 V 27 PF+-5%	CCC1009	1	1	
C332	C,CERAMIC 500 V 1 PF+-0.25PF	CCC1353	1	1	1
C333	C,CERAMIC 500 V 1 PF+-0.25PF	CCC1353	1	1	1
C334	C,AL ELYC 25 V 10 UF	CEC0175	1	1	1
C338	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1	1
C343	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1	1
C344	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1	1
C345	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1	1
C346	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1	1
C350	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002	1	1	1
C1034	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1	1
C1102	C,AL ELYC 250 V 4.7 UF	CEC0219	1	1	1
D301	DIODE HZ5B T-D	HDH0029	1	1	1
D302	DIODE HZ5B T-D	HDH0029	1	1	1
D303	DIODE HZ5B T-D	HDH0029	1	1	1
D1032	DIODE HZ24B	HDH0091			1
D1103	DIODE 1S2075 T-D	HDS0108	1	1	1
L336	COIL FL-3H 1ROM	TLF0054			1
L337	COIL FL-3H 1ROM	TLF0054			1
L336	COIL FL-3H 3R3M	TLF0060	1	1	
L337	COIL FL-3H 3R3M	TLF0060	1	1	
P301	CONNECTOR 171825-8	JBX0467	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
P1031	CONNECTOR 171825-3	JBX0468	1	1	1
PEF-469	PCB	HX116413	R	R	R
		HX283858	R	R	R
		HX8311790	R	R	R
R320	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060			1
R321	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R322	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R323	R,CARBON 1/4W 100 OHM+-5%	RCR3028			1
R324	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R325	R,CARBON 1/4W 10 OHM+-5%	RCR3004			1
R326	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R327	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R328	R,CARBON 1/4W 680 OHM+-5%	RCR3048	1	1	1
R329	R,CARBON 1/4W 680 OHM+-5%	RCR3048	1	1	1
R330	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061	1	1	1
R331	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061	1	1	1
R332	R,METAL 1 W 33 KOHM+-5%	RMR2785	1	1	
R332	R,METAL 1 W 22 KOHM+-5%	RMR2784			1
R333	R,METAL 1 W 22 KOHM+-5%	RMR2784			1
R333	R,METAL 1 W 33 KOHM+-5%	RMR2785	1	1	
R334	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	1	1
R335	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	1	1
R336	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	
R336	R,CARBON 1/4W 220 OHM+-5%	RCR3036			1
R337	R,CARBON 1/4W 220 OHM+-5%	RCR3036			1
R337	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1	
R338	R,CARBON 1/2W 47 KOHM+-5%	RCR3199	1	1	
R338	R,CARBON 1/2W 33 KOHM+-5%	RCR3195			1
R339	R,METAL 1 W 47 KOHM+-5%	RMR2786	1	1	
R339	R,CARBON 1/2W 33 KOHM+-5%	RCR3195			1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R340	R,CARBON 1/2W 33 KOHM+-5%	RCR3195			1
R340	R,METAL 1 W 47 KOHM+-5%	RMR2786	1	1	
R341	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	1	1
R342	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	1	1
R343	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R344	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1	1
R345	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1	
R345	R,CARBON 1/4W 180 OHM+-5%	RCR3034			1
R346	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1	
R346	R,CARBON 1/4W 180 OHM+-5%	RCR3034			1
R350	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
R1032	R,CARBON 1/4W 100 KOHM+-5%	RCR3100			1
R1033	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1	
R1033	R,CARBON 1/4W 33 KOHM+-5%	RCR3088			1
RV1033	VR,CARBON EVT-S0AA00B54	RDE0018	1	1	1
		HX8311713	R	R	R
		HX8311704	R	R	R
R1034	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1	
R1034	R,CARBON 1/4W 33 KOHM+-5%	RCR3088			1
RV1035	VR,CARBON EVT-S0AA00B25	RDE0029	1	1	1
		HX8311713	R	R	R
		HX8311704	R	R	R
R1036	R,CARBON 1/4W 220 OHM+-5%	RCR3036			1
R1101	R,METAL 1 W 33 KOHM+-5%	RMR2785	1	1	
R1101	R,CARBON 1/2W 15 KOHM+-5%	RCR3187			1
R1103	R,CARBON 1/2W 22 KOHM+-5%	RCR3191	1	1	
R1103	R,CARBON 1/2W 22 KOHM+-5%	RCR3191			1
R1104	R,METAL 1/4W 113 KOHM+-1%	RME0740	1	1	
R1104	R,METAL 1/4W 88.7 KOHM+-1%	RME0725			1
R1105	R,METAL 1/4W 20.5 KOHM+-1%	RME0724	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
TR303	TRANSISTOR 2SC1906	HTC0338	1	1	1
TR304	TRANSISTOR 2SC1906	HTC0338	1	1	1
TR305	TRANSISTOR 2SC641K-C	HTC0192	1	1	1
TR306	TRANSISTOR 2SC641K-C	HTC0192	1	1	1
TR307	TRANSISTOR 2SD668A-C	HTD0100	1	1	1
TR308	TRANSISTOR 2SD668A-C	HTD0100	1	1	1
TR309	TRANSISTOR 2SB648A-C	HTB0087	1	1	1
TR310	TRANSISTOR 2SB648A-C	HTB0087	1	1	1
TR311	TRANSISTOR 2SA781K	HTA0099	1	1	1
TR312	TRANSISTOR 2SA781K	HTA0099	1	1	1
TR1101	TRANSISTOR 2SC1723	HTC0492	1	1	1
TR1102	TRANSISTOR 2SC1722	HTC0514	1	1	1

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(PEF-470,471)

Symbol	Description	Code	Q'ty		
			151B	152B	302B
R1031	R,CARBON 1/4W 100 KOHM+-5%	RCR3100	1	1	1
J1032	SOCKET PS-085	JSP0001	1	1	1
PEF-470	PCB	HX116413	R	R	
		HX283858	R	R	
		HX8311790	R	R	
PEF-471	PCB	HX116413			R
		HX283858			R
		HX8311790			R

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(PEF-472)

Symbol	Description	Code	Qty		
			151B	152B	302B
C271	C,CERAMIC 50 V10000 PF	CCC1030	1		
C1202	C,PLASTIC 50 V10000 PF+-10%	CQA0097	1	1	1
C1203	C,AL ELYC 25 V 100 UF	CEC0177	1	1	1
C1204	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1029	1	1	1
IC1201	IC CD 4011 UBE	IDC0089	1	1	1
PEF-472	PCB	HX116413	R	R	R
		HX283858	R	R	R
		HX8311790	R	R	R
R271	R,CARBON 1/4W 470 KOHM+-5%	RCR3104	1		
R272	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1		
R273	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1		
R274	R,CARBON 1/4W 6.8 KOHM+-5%	RCR3072	1		
RV273	VR,CARBON EVL-SOAA00B23	RDE0015	1		
		HX8311711	R		
		HX8311704	R		
RV518	VR,CARBON V16L4G11N20KC B2K+100KOHM	HX3142132-A	1		
RV518	VR,CARBON V16L4-N20KC B2KOHM	HX3142131-B		1	1
R518	R,CARBON 1/4W 820 OHM+-5%	RCR3050	1	1	1
R519	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
RV806	RV,CARBON EVL-SOAA00B53	RDE0004	1		
		HX8311711	R		
		HX8311704	R		
R807	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1		
RV815	VR,CARBON EVH-Y13K20B14	RDE0003	1	1	1
		HX8311705	R	R	R
		HX8311701	R	R	R
R1201	R,CARBON 1/4W 39 KOHM+-5%	RCR3090	1	1	1
R1202	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1	1
R1203	R,CARBON 1/4W 15 KOHM+-5%	RCR3080	1	1	1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
RV1203	VR,CARBON EVL-SOAA00B53	RDE0004	1	1	1
		HX8311711	R	R	R
		HX8311704	R	R	R
R1204	R,CARBON 1/4W 750 OHM+-5%	RCR3049	1	1	1
TR271	TRANSISTOR 2SK106C	HTK0068	1		
TR272	TRANSISTOR 2SC458C	HTC0148	1		

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(PEF-473,474)

Symbol	Description	Code	Qty		
			151B	152B	302B
C1	C,PLASTIC 600 V22000 PF+-10%	CQX0071		1	1
C101	C,PLASTIC 600 V22000 PF+-10%	CQX0071	1	1	1
PEF-473	PCB	HX116413		R	R
		HX283858		R	R
		HX8311790		R	R
PEF-474	PCB	HX116413	R	R	R
		HX283858	R	R	R
		HX8311790	R	R	R
S1	SW,SLIDE SSB023 L=9 NS PCB	SSV0042		1	1
S101	SW,SLIDE SSB023 L=9 NS PCB	SSV0042	1	1	1

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(CHASSIS)

Symbol	Description	Code	Q'ty		
			151B	152B	302B
DL301	DELAY LINE CD-3A	HX8311741-B			1
D1112	DIODE SR103D(WITH MOUNT)	HDS0234	1	1	1
F1101	FUSE MF61NM 1 (1A 250V)JIS	EFG0344	R	R	R
F1101	FUSE MF61NM 2 (2A 250V)JIS	EFG0352	1	1	1
J1	COAX.CON BNC071	JHB0088		1	1
J2	MULTI.CON J2	HX3142036-A		1	1
J101	COAX.CON BNC071	JHB0088	1	1	1
J102	MULTI.CON J102	HX3142036-B	1	1	1
J201-251	MULTI.CON J201	HX3142036-G		1	1
J202-405	MULTI.CON J202	HX3142036-H		1	1
J203-406	MULTI.CON J203	HX3142036-I	1	1	1
J1102	MULTI.CON J1102	HX3142036-J	1	1	1
J301	MULTI.CON J301	HX3142036-K	1	1	1
J401	COAX.CON BNC071	JHB0088	1	1	1
J402	JACK TJ-3020	JJT0028	1	1	1
J801	MULTI.CON J801	HX3142036-E	1	1	1
J901	COAX.CON BNC071	JHB0088	1	1	1
J905	MULTI.CON J905	HX3142036-C	1	1	1
J1001	CONNECTOR 171822-3	JBX0449	1	1	1
	CONTACT 170205-1	JYX0252	2	2	2
	CONNECTOR 163690-9 (2.5MM)	JBX0043	1	1	1
	CONTACT 163691-1	JYX0059	6	6	6
J1002	MULTI.CON J1002	HX3142036-F	1	1	1
J1031	MULTI.CON J1031	HX3142036-D	1	1	1
	HLDR CB-3	ERS0004	1	1	1
J1102	TERMINAL CM3 (C-170)	JJC0026	1	1	1
J1103	TERMINAL S-17221(100.120/220/240V)	HX3142147-I	1	1	1
J1201	TERMINAL BLACK	HX4114183-A	1	1	1
L1026	COIL	HX8311683	1	1	1
P1020	ANODE CAP C-502R(0.8M)	DYC0001			1

Symbol	Description	Code	Q'ty		
			151B	152B	302B
P1101	CABLE,AC VM1165B-1172B 3.0M	BBZ0182	1	1	1
R71	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1	1
R171	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1	1
R400	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1	1
RV1016	VR,CARBON EVM-R7GS20B26	RDE0028	1	1	1
		HX8311714	R	R	R
RV1026	VR,CARBON EVH-COAS15B14	RDE0009	1	1	1
		HX8311707	R	R	R
		HX8311702	R	R	R
RV1101	VR,CARBON V24L5S(U12DV-C) 20KC-10KOHM	HX3142133-A	1	1	1
T1101	XFMR T501	HX8311681	1	1	1
V1001	CRT 130BUB31	DPX0019	1	1	
V1001	CRT 130BTB31	DPX0054			1

Symbol	Description	Code	Qty		
			151B	152B	302B
	WIRE PEV-AL BRO	448932~36	0.7	0.7	0.7M
	WIRE PEV-AL RED	448932~36	0.4	0.4	0.4M
	WIRE PEV-AL ORG	448932~36	0.7	0.7	0.7M
	WIRE,VINYL WL1H12/0.18 YEL	BBA0040	1.2	1.2	1.2M
	WIRE,VINYL WL1H7/0.18 BLU	BBA0139	0.3	0.3	0.3M
	WIRE,VINYL WL1H7/0.18 RED	BBA0140	0.2	0.2	0.2M
	WIRE,VINYL WL1H7/0.18 YEL	BBA0143	0.5	0.5	0.5M
	WIRE,VINYL WL1H7/0.18 BLK	BBA0144	0.6	0.6	0.6M
	WIRE,VINYL WL1H7/0.18 WHT	BBA0147	0.2	0.2	0.2M
	WIRE,VINYL WL1H7/0.18 ORG	BBA0157	0.4		
	WIRE,VINYL WL1H7/0.18 BRN	BBA0160	0.3	0.2	0.2M
	WIRE,VINYL WL1H7/0.18 GRY	BBA0161	0.3	0.3	0.3M
	WIRE,VINYL WL1H7/0.18 GRN	BBA0164	0.2	0.2	0.2M
	SS-4	ERL0010	0.1	0.1	0.1M
	HP-5N	HX4124935			2
	WL1H7/0.18×2 ORG×BLK	BBG0004	0.3	0.3	M
		BSA0031	0.01	0.01	0.01
		ERL0002	15	15	15
		BSE0001	0.2	0.2	0.2M
		BSA0003	0.1	0.1	0.1M
		ERA0006	0.1	0.4	0.4M
		ERB0010	0.1	0.1	0.1M
		HX43196	3	3	3
	G746 200G	VOZ0002	0.01	0.01	0.01

MECHANICAL REPLACEABLE PARTS LIST (V-151B / V-152B / V-302B)

Symbol	Description	Code	Qty	Remarks
1	Subpanel, front	117459-A	1	
	Cushion	8316262-B	1	
2	Panel, front	284347～48-A	1	V-151B
2	Panel, front	284349～50-A	1	V-152B, V-302B
3	Panel, rear	292447-AA	1	
4	Angle	284352-AA	2	
5	Angle	285083-AA	1	
6	Angle	284395-B	1	
7	CRT shield plate	3140790-A	1	
	Cushion	8316262-E	1	
8	CRT band	3144088-A	1	V-151B, V-152B
	CRT band	3140791-A	1	V-302B
9	CRT bandCRT	3144088-B	1	V-151B, V-152B
	CRT band	3140791-B	1	V-302B
10	Shield plate, Time	8312139-A	1	
11	Bracket, VR	8312140-A	1	
12	Bracket, H board	8312141-A	1	
13	Bracket, L	8318957-A	1	
14	Cover	284357-A	1	
15	Cover, bottom	292448-A	1	
21	Heat sink	8329719-A	6	
22	Heat sink	8329720-A	2	
23	Shield case, HV	8316093-A	1	
24	Earth plate	8318959-A	2	
30	Shield band, CRT	8316268-A	1	V-151B, V-152B
30	Shield band, CRT	8316268-B	1	V-302B
31	Bezel	282239	1	
	Name plate	8316261-E	1	V-151B
	Name plate	8316261-F	1	V-152B
	Name plate	8316261-H	1	V-302B

Symbol	Description	Code	Qty	Remarks
	Dial plate	3147500-A	1	
	Clip	XCF0141	2	
33	Knob, S18	3149321-A	6	V-151B
	Knob, S18	3149321-A	8	V-152B, V-302B
34	Knob, S22	3140804-A	2	V-151B
	Knob, S22	3140804-A	3	V-152B, V-302B
35	Knob,LSW	3149325-B	2	V-151B
	Knob,LSW	3149325-B	3	V-152B, V-152B
36	Knob, S24	3149322-B	1	
37	Rubber	3144055-A	2	V-151B, V152B
37	Rubber	3144055-B	2	V-302B
41	Foot	3140755-A	2	
42	Bush	ERR0073	1	
43	Support	8340165-D	6	
44	Spacer	XCI0097	1	
45	Handle	8305589-A	1	
49	Plate	8318971-A	1	
50	Label	8316162-A	1	
51	Rubber	8322428-A	1	V-151B, V-152B
	Rubber	8322428-B	1	V-302B
52	Band	ERL0009	1	V-151B, V-152B
	Band	ERL0093	1	V-302B
53	Foot, rear	3149317-A	4	
54	Stand	8345455-B	1	
55	Holder, stand	8345456-A	2	
56	Foot, stand	8345457-A	2	

Symbol	Description	Code	Qty	Remarks
80	Screw	XCA6205	3	M2×5
81	Screw	XCA1598	8	M3×5
82	Screw	XCA6308	25	M3×8
83	Screw	XCA6310	4	M3×10
84	Screw	XCA6316	1	M3×16
85	Screw	XCA1797	2	M3×20
87	Screw	XCA0126	2	M4×16
89	Screw, flat	XCA0168	4	M2.6×4
90	Screw, flat	XCA7306	23	M3×6
91	Screw, flat	XCA7308	3	M3×8
93	Washer, spring	XCA1879	2	M3
94	Washer, spring	XCA1881	2	M4
95	Washer	XCA1855	1	M3
96	Washer	XCA1857	1	M4
97	Nut	XCA1706	2	M3
98	Nut	XCA1707	2	M4
99	Screw	XCA6410	4	M4×10
100	Screw, sems	8340167-C	4	M4×20

HITACHI DENSHI, LTD.
3-5-1, Kanda Sudacho, 1-chome, Chiyoda-ku, Tokyo 101, Japan
Phone : 03-3256-4411, Telex : J24173

HITACHI DENSHI AMERICA, LTD.*

Headquarters and New York Office
150 Crossways Park Drive, Woodbury, New York 11797, U. S. A.
Phone : (516) 921-7200, FAX : 516-496-3718, Telex : 510-221-1899

Chicago Office
500 East Irving Park Road, Suite 115 Itasca, Illinois 60143, U. S. A.
Phone : (708) 250-0490 FAX : 312-250-0054

Los Angeles Office
21515 Vermont Ave., Suite 210 Torrance, California 90502, U. S. A.
Phone : (310) 328-6117, FAX : 310-328-6282

Dallas Office
4500 North Central Expressway Suite 1000, Dallas, Texas 75234, U. S. A.
Phone : (214) 691-8651, FAX : 214-691-4292

Atlanta Office
[illegible] U. S. A.
[illegible]

HITA[illegible]
[illegible]
Phone : [illegible] Canada
Phone : [illegible] FAX : 852-5324

Ottawa Office
[illegible] Canada
Phone : (613) 232-5647, FAX : (613) 232-1964, Telex : 053-4135

Quebec Office
[illegible] Canada
Phone : (514) 694-7710, FAX : (514) 694-4061, Telex : 055-60768

HITACHI DENSHI (EUROPA) GmbH*

Head Office
P. O. Box 1270, D-8182 Rodgau, Germany
Phone : (06106) 8433-1, FAX : (06106) 15906, Telex : 417-849

HITACHI DENSHI (U. K.) LTD.*

Head Office
Perivale Industrial Centre, Horsenden Way, Perivale, London NW10 0AQ,
United Kingdom
Phone : (81) 998-4011, FAX : 81-998-3451, Telex : 27449

Leeds Office
Hitachi House, 26 Manor Road, Hyde, LS11, 5BZ, United Kingdom
Phone : 0532-430294, FAX : 0532-459263

* Subsidiaries of Hitachi Denshi, Ltd.

www.manualsplus.com
1037484

Printed in Japan VZP1805
FHC-4270